CHILD DEVELOPMENT

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VOLUME 14

MARCH, 1943 to DECEMBER, 1943

WASHINGTON, D. C.

SOCIETY FOR RESEARCH IN CHILD DEVELOPME
NATIONAL RESEARCH COUNCIL
1943

CHILD DEVELOPMENT

CONTENTS

VOLUME 14, 1943

Number 1, March, 1943

Skeletal maturing in adolescence as a basis for determining percentage of completed growth.
Nancy Bayley 1

Number 2, June, 1943

Size and body build of adolescents in relation to rate of skeletal maturing.
Nancy Bayley 47
Affectivity and growth in children.
Elizabeth Mechem 91

Number 3, September, 1943

In the direction of a better humanity.
Leon Nordau 117
Gain in weight during pregnancy.
Helen R. Robinson, Alan F. Guttmacher, Edmund P. H. Harrison, Jr., and John M. Spence, Jr. 131
Student and child relationships in the nursery school.
Margaret Nesbitt 143
A preliminary scale for the measurement of the mentality of infants.
Anna M. Shotwell and A. R. Gilliland 167

Number 4, December, 1943

Influences of war as evidenced in children's play.
Eleanor Palmer Bonte and Mary Musgrove 179
The hurdle jump as a measure of the motor proficiency of young children.
Doris M. Hartman 201
The effects of early institutional care on adolescent personality (graphic Rorschach data).
William Goldfarb 213

SKELETAL MATURING IN ADOLESCENCE AS A BASIS FOR DETERMINING PERCENTAGE OF COMPLETED GROWTH

by

NANCY BAYLEY

CONTENTS

LIST OF TABLES 2

LIST OF FIGURES 2

INTRODUCTION 5

SAMPLE 5

THE SKELETAL DATA: METHODS, ADEQUACY AND SELECTION OF CRITERIA 6

THE ANTHROPOMETRIC DATA 12

RELATIVE SIZE IN TERMS OF SKELETAL MATURITY.... 12
  Method of determining per cent of mature size 12
  Comparison between chronological age and skeletal age as a basis for determining proportionate growth 13

PER CENT OF MATURE SIZE COMPARED WITH RATES OF MATURING 33

FACTORS AFFECTING GROWTH IN INDIVIDUAL CASES.. 34

THE SEXES COMPARED FOR RELATIVE GROWTH RATES 40

SUMMARY 44

REFERENCES 45

ACKNOWLEDGMENTS 46

LIST OF TABLES

1. Correlations between first and second independent assessments of skeletal maturity........................ 6
2. Comparisons of ratings made by cross-sectional and seriatim assessments of the hands of four boys....... 8
3. Means and S.D.'s of skeletal age ratings by half-year intervals, given in years and decimals of a year...... 9
4. Correlations between skeletal age assessments of hand and knee x-rays... 10
5. Correlations for consistency in skeletal assessments: Boys.. 10
6. Means and S. D.'s of per cent of mature size attained at successive ages... 14
7. Height correlated with chronological age and skeletal age.. 28
8. Correlations between skeletal age and per cent of mature stem length, bi-iliac diameter, weight and chest circumference.. 29
9. Correlations showing consistency of growth in height. 31
10. Means and S.D.'s of skeletal age scores at given chronological ages for groups divided according to age at reaching mature skeletal status 34
11. Means and S. D.'s of per cent of mature height for early-, average-, and late-maturing children: grouped according to C. A. at reaching complete skeletal maturity 35

LIST OF FIGURES

1. Correlations showing the consistency of assessments of x-rays of boys' hands, knees, and the average of the two, over periods of from six months to three years 11
2. Per cent of mature height attained by an early-maturing boy, Case F 5, at successive chronological ages, as compared with the total group................. 16
3. Per cent of mature height attained by Case F 5 at successive skeletal ages, as compared with the total group 16
4. Per cent of mature stem length attained by Case F 5 at successive chronological ages, as compared with the total group.. 17
5. Per cent of mature stem length attained by Case F 5 at successive skeletal ages, as compared with the total group 17

6. Per cent of mature bi-iliac diameter attained by Case F 5 at successive chronological ages, as compared with the total group.......... 18
7. Per cent of mature bi-iliac diameter attained by Case F 5 at successive skeletal ages, as compared with the total group.......... 18
8. Per cent of mature height attained by an early-maturing boy, Case E 10, as compared with the total group.. 19
9. Per cent of mature height attained by Case E 10 at successive skeletal ages, as compared with the total group.......... 19
10. Per cent of mature stem length attained by Case E 10 at successive skeletal ages, as compared with the total group.......... 20
11. Per cent of mature stem length attained by Case E 10 at successive skeletal ages, as compared with the total group.......... 20
12. Per cent of mature bi-iliac diameter attained by Case E 10 at successive chronological ages, as compared with the total group.......... 21
13. Per cent of mature bi-iliac diameter attained by Case E 10 at successive skeletal ages, as compared with the total group.......... 21
14. Per cent of mature height attained by a late-maturing boy, Case A 1, at successive chronological ages, as compared with the total group.......... 22
15. Per cent of mature height attained by Case A 1 at successive skeletal ages, as compared with the total group.......... 22
16. Per cent of mature stem length attained by Case A 1 at successive chronological ages, as compared with the total group.......... 23
17. Per cent of mature stem length attained by Case A 1 at successive skeletal ages, as compared with the total group.......... 23
18. Per cent of mature bi-iliac diameter attained by Case A 1 at successive chronological ages, as compared with the total group.......... 24
19. Per cent of mature bi-iliac diameter attained by Case A 1 at successive skeletal ages, as compared with the total group.......... 24
20. Per cent of mature height attained by a late-maturing boy, Case B 20, at successive chronological ages, as compared with the total group.......... 25
21. Per cent of mature height attained by Case B 20 at successive skeletal ages, as compared with the total group.......... 25
22. Per cent of mature stem length attained by Case B 20

at successive chronological ages, as compared with the total group 26
23. Per cent of mature stem length attained by Case B 20 at successive skeletal ages, as compared with the total group 26
24. Per cent of mature bi-iliac diameter attained by Case B 20 at successive chronological ages, as compared with the total group 27
25. Per cent of mature bi-iliac diameter attained by Case B 20 at successive skeletal ages, as compared with the total group 27
26. Correlations showing consistency of growth in height of boys, in relation to chronological age and to skeletal age 31
27. Curves of the mean values for per cent of mature height attained by early-, average-, and late-maturing girls, adjusted to equivalent skeletal ages 36
28. Curves of the mean values for per cent of mature height attained by early-, average-, and late-maturing boys, adjusted to equivalent skeletal ages 36
29. Per cent of mature height attained by a late-maturing boy, Case A 15, at successive chronological ages..... 39
30. Per cent of mature height attained by Case A 15 at successive skeletal ages. Prediction of mature height at the earlier skeletal ages would have been poor in this case 39
31. Curves of the mean values of height for boys and girls.... 41
32. Curves of the mean values of stem length for boys and girls 41
33. Curves of the mean values of bi-iliac diameter for boys and girls 42
34. Curves of the mean values of biacromial diameter for boys and girls 42
35. Curves of the mean values of per cent of mature height, adjusted to equivalent skeletal maturity 43
36. Curves of the mean values of per cent of mature stem length adjusted to equivalent skeletal maturity 43

SKELETAL MATURING IN ADOLESCENCE AS A BASIS FOR DETERMINING PERCENTAGE OF COMPLETED GROWTH

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INTRODUCTION

Recent studies of skeletal development have furnished us with standards which allow for significant differentiation of skeletal maturity, within homogeneous chronological age groups, throughout the span of childhood. These standards, in the form of x-ray pictures, give us a valuable instrument for measuring an important aspect of anatomical development. In the Adolescent Growth Study of the Institute of Child Welfare, x-rays of the left hand and knee were taken at six-month intervals on 90 boys and 87 girls, beginning when the subjects averaged 14 years of age, and continuing for 4 1/2 years. Thus, most of the cases were x-rayed nine times unless complete epiphyseal closure rendered further records unnecessary.

SAMPLE

The selection of cases for this study has been described elsewhere (6). At the time the study started, they were members of the fifth grade in several Oakland public schools which are located in districts representing a range in socio-economic status similar to that of Oakland as a whole. The majority of the cases (87 per cent) are of "Old American" or North European stock, but there are a few (11 boys and 12 girls) who do not fit into this classification. These 23 children who are racially different from the principal group include 13 Italians (4 boys and 9 girls), 4 Jews (1 boy and 3 girls), 2 boys who are part Spanish, and 4 boys who are respectively Hungarian, Armenian, Mexican and part Tahitian.

THE SKELETAL DATA: METHODS, ADEQUACY AND SELECTION OF CRITERIA

The x-rays have been assessed according to the Todd standards (11, 12) which furnish norms for the sexes separately throughout childhood, standards being spaced at six-month intervals from the age of 3 years until complete closure of the epiphyses.[1]

Assessments made from these standards have been found to be adequately reliable (Table 1) (2, 8). In this sample correlation coefficients have been computed between two independent assessments by the same rater for each six-month age interval,[2] for nine successive ages. These *r*'s, for the boys' x-rays, range from .93 to .97 for the hands and from .87 to .96 for the knees. Two separate raters agreed with each other almost as well for two sets of films (age range 2 years, S.D. 6 months) the *r*'s being .92 and .94 for hands, and .91 and .85 for knees. Reliabilities are similarly high for the girls, but could be computed for only a few age levels in this study because of the early age at which girls reach maturity. For five ages the girls' *r*'s for the hand assessments (first by second rating) range from .93 to .98, and for the knees from .91 to .96. The final assessments used in all comparisons of skeletal maturity are based on at least two independent ratings.

TABLE 1

CORRELATIONS BETWEEN FIRST AND SECOND INDEPENDENT ASSESSMENTS OF SKELETAL MATURITY

	Hands				Knees			
C.A.	Boys		Girls		Boys		Girls	
	n	*r*	n	*r*	n	*r*	n	*r*
13.7	40	.89	39	.93	41	.95	39	.91
14.2	72	.95	67	.94	72	.89	68	.96
14.7	78	.94	82	.96	78	.93	82	.95
15.2	81	.97	77	.98	80	.96	77*	.96*
15.7	76	.96	63	.97	76	.90	63*	.92*
16.2	74	.93			75	.91		
16.7	74	.93			74	.87		
17.2	74	.96			74*	.90*		
17.7	60	.96			60*	.91*		
18.2	31	.95*						

*Skewed distribution

---

[1] *The relative merits of available standards have been discussed in an earlier paper (2). The decision was reached that, for use with our data, the Todd standards are the best now available.*

[2] *The age-intervals used in this study have been selected to coincide with those used in the Todd standards, that is, 14.0 to 14.4, with the mid-point at 14.2 years.*

Where the first and second rating did not agree a third rating was made, and if necessary, additional ones, until agreement occurred two or more times. Hence, the reliabilities of the final assessments used are higher than those given here for single ratings.

The ratings described above were made by what we may call the cross-sectional method; i.e., all of the x-rays taken at a single grade-level were assessed independently of any child's earlier or later x-rays. It appeared that a further check on this method of rating could be made, and possibly better results could be achieved by re-assessing each child's films, seriatim - that is, by spreading out in a row all of his films for the same bone area, and comparing them with the standards in series. Assessments made by the cross-sectional method had resulted in several instances in which a child appeared at a later age to have regressed to a less mature status than that assigned at an earlier age. The 5 boys with such reversals, with the addition of a random selection of 27 others, (enough to make an adequate number for statistical comparisons) were re-assessed, seriatim. This, of course, does not form a representative sample, but instead is heavily weighted with the least reliably assessed cases. The seriatim ratings eliminated all apparent regressions in maturity (it was clear from re-inspection of the films that no child had actually regressed), and in addition made the rate of progress of a number of cases more regular than had appeared from the original cross-sectional ratings. Examples are given in Table 2. Obviously, for a number of children, a truer picture of their growth rates is obtained by the seriatim assessments. However, such a re-rating of all cases would be laborious, and it cannot be recommended for general use since the procedure is one that can be used only in the terminal stages of a longitudinal study. For the 32 boys who had been re-assessed by this method an investigation was made of the extent of the advantage to be derived from this more careful procedure. On a total of 261 x-rays, for these 32 boys, the cross-section assessments were found to correlate .987 with the seriatim assessments. For those assessments made at the ages 15.0 to 15.4 inclusive (a single x-ray for each boy), the $\underline{r}$ was .957. (This particular age was chosen because it was the only age at which all 32 boys were represented.) The average absolute difference of the 261 ratings is .15 of a year. In general the differences between the two methods of rating have been magnified by the selection of cases, and even though the seriatim assessments have corrected errors in a number of instances, it was decided, because of the time it would take, not to re-assess the additional cases in which we should expect fewer and smaller errors.

TABLE 2

COMPARISON OF RATINGS MADE BY CROSS-SECTIONAL AND SERIATIM ASSESSMENTS OF THE HANDS OF FOUR BOYS

Serial Order of X-ray (6-month intervals)	Case F 11		Case E 8		Case A 11		Case E 23	
	I*	II*	I	II	I	II	I	II
1	26**	26	23	22	19	19	21	21
2	28	27+	23	23+	19+	20+	21	22
3	29	28	25	25	21	21	22	23
4	28+	28+	26	26	22	22	24	24
5	29	29	26	27	24	24	24	25-
6	31	31	28	28-	24	24	25+	25+
7	31	31+	29	28	26	26-	27+	27+
8	-	-	28	29	26	26	29	29
9	32	32	31	31	-	-	30	30

*The assessments in columns labeled I were made independently of other records for the same child; those in columns marked II were made with all of a child's x-rays laid out in series for comparisons.

**These numbers are the ones Todd originally assigned to his hand standards, which were numbered consecutively starting with number 1 for the 3-year standard. Each number represents a six-month step in the series.

For the most part, this group of children appears to be similar to those from whom Todd derived his standards. Means and S. D.'s are given in Table 3. The only marked deviation occurs in the boys' knees at the ages 17.0 to 17.4. Here the mean skeletal age assessment for our group is only 16.9, indicating relative immaturity in the Oakland boys as compared with Todd's Cleveland standardization sample. However, the actual rates of change at this stage of maturity are very slow - much slower than at earlier ages - and for this reason the retardation may not be significant. Such retardation as does occur might be due to any of several factors, such as a slowing down of growth rates, or some consistent error in the knee standards, or in the interpretation of the standards at this level.[3]

In the present treatment of the data the assessments of the hand and knee are averaged to form a single skeletal age, in order to secure a more reliable and comprehensive indicator of the developmental status of the skeleton. Let us consider the reasons for this choice. As we have seen, the ratings of the hands appear to be slightly more reliable than those of the

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[3] *By this last possibility, I refer to the fact that some of of the standards are rather ambiguous and more difficult to interpret than the others. We have found a tendency to avoid assigning the ratings which these less clear standards represent.*

TABLE 3

MEANS AND STANDARD DEVIATIONS (S.D.) OF SKELETAL AGE RATINGS BY HALF-YEAR INTERVALS, GIVEN IN YEARS AND DECIMALS OF A YEAR

C.A.	Hands						Knees					
	Boys			Girls			Boys			Girls		
	n	Mean	S.D.	n	Mean	S.D.	n	Mean	S.D.	n	Mean	S.D.
13.2	15	13.1	.8	11	13.2	.9	15	13.1	.6	11	13.3	1.1
13.7	40	13.6	.9	39	13.9	1.0	40	13.7	.8	39	13.9	1.0
14.2	75	14.1	1.0	73	14.4	1.0	76	14.2	.9	72	14.4	1.1
14.7	84	14.8	1.0	87	14.9	1.0	83	14.7	1.0	87	14.9	1.0
15.2	90	15.1	1.0	81	15.3	.9	90	15.2	1.0	81	15.3	.9
15.7	81	15.7	1.0	78	15.6	.8	80	15.6	.8	78	15.6	.8
16.2	79	16.3	.9				80	16.2	.8			
16.7	75	16.7	1.0				75	16.5	.8			
17.2	73	17.3	.9				73	16.9	.7			

knees. Furthermore, the two areas correlate highly in bone maturity (Table 4): the r's between hand and knee range from .85 to .88 for the boys, and from .86 to .90 for the girls (r's computed for each half-year age interval). If one x-ray area were to be depended upon, the hand is the obvious choice, because of the greater reliability in assessment. However, as shown in Table 5 and illustrated for one series in Figure 1, the combined assessments give higher inter-year correlations over a period of years than either the hand or knee alone, indicating greater consistency and a more stable measure when assessments for both areas of the body are combined. It may also be assumed that errors in assessment tend to cancel out in the combination.

Using this measure of skeletal age, we have made comparisons with other physical aspects of development in the same group of children. One limitation set on the comparisons of our skeletal data with the other material is that the x-rays were not obtained in the initial years of the study. Hence, emphasis must be placed on the terminal, and near-terminal points of skeletal growth. This limitation, however, may not be very serious because there are definite advantages in using a terminal or relatively static point in the growth process as a basis for comparisons in the study of growth. From the standpoint of physical growth, there is much to be said for taking as a standard the point at which complete epiphyseal union is achieved (i.e., maturity on the Todd standards) and the final size of the skeleton is determined. There will be little subsequent deviation from this, and any changes which do occur are very slight in comparison with those which have gone before.

TABLE 4

CORRELATIONS BETWEEN SKELETAL AGE ASSESSMENTS OF HAND AND KNEE X-RAYS

	Boys		Girls	
C.A.	n	r	n	r
13.7	40	.88	39	.90
14.2	72	.85	68	.88
14.7	78	.85	82	.89
15.2	80	.88	77	.89
15.7	76	.86	63*	.88*
16.2	74	.85	63*	.86*
16.7	74	.87		
17.2	74	.87		
17.7	60*	.82*		

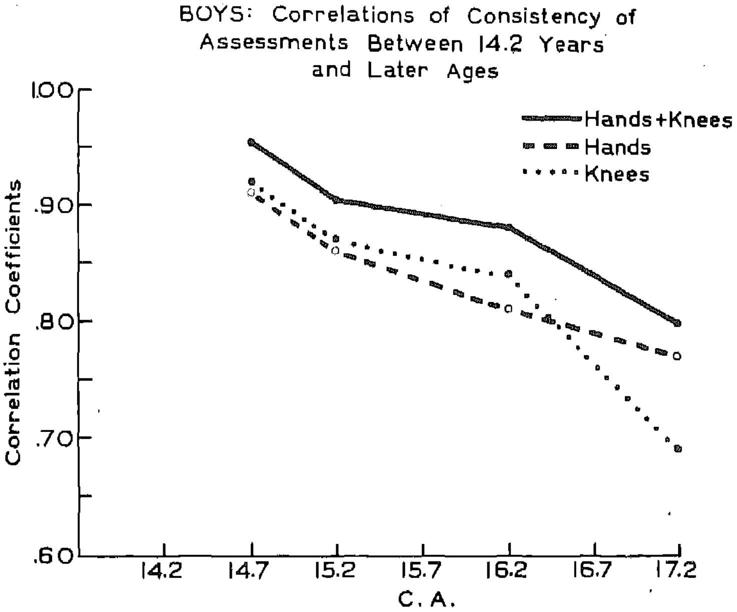
*Skewed distribution

TABLE 5

CORRELATIONS FOR CONSISTENCY IN SKELETAL ASSESSMENTS

	BOYS					
	Hands		Knees		Hand-Knee Average	
	Assessments at 13.7 Years with Later Ages					
C.A.	n	r	n	r	n	r
14.2	34	.91	34	.87	34	.96
14.7	40	.84	40	.84	37	.90
15.7	32	.70	31	.76	31	.79
	Assessments at 14.2 Years with Later Ages					
14.7	67	.92	66	.91	63	.95
15.2	69	.86	72	.87	64	.90
16.2	58	.81	59	.84	57	.88
17.2	57	.77	58	.69	57	.80
	Assessments at 14.7 Years with Later Ages					
15.2	76	.92	76	.87	71	.94
15.7	73	.90	72	.79	66	.91
16.7	70	.88	70	.80	66	.88
	Assessments at 15.2 Years with Later Ages					
15.7	79	.92	81	.85	72	.94
16.2	78	.87	68	.84	71	.90
17.2	71	.84	72	.77	70	.87
	Assessments at 15.7 Years with Later Ages					
16.2	73	.91	73	.84	69	.94
16.7	70	.92	69	.88	67	.93
	GIRLS					
	Assessments at 13.7 Years with Later Ages					
14.2	39	.92	39	.86	37	.94
14.7	40	.92	40	.84	38	.91
	Assessments at 14.2 Years with Later Ages					
14.7	73	.93	72	.91	67	.95

Figure 1



Relative deviation from such a stable position can then be expressed for other ages and data.

The exact points of maturity which we selected differ for the sexes - a difference necessitated by the nature of our data. At the time the first x-rays were taken four of the girls had already attained complete closure of the epiphyses of hand and knee. At the time of the last examination all but eleven of the girls had reached skeletal maturity. It is possible, then, to determine for most of the girls the age at which complete closure occurred (a skeletal age of 16 years, 3 months on the Todd standards). The situation for the boys is considerably different, because they mature, on the average, 2 years later than the girls. The Todd standards represent complete closure of the epiphyses of the boys' hands at 18 years, 9 months and of their knees at 18 years, 3 months. At the time our data collection was discontinued less than half of the boys had reached this mature status. However, all but seven had reached the standard of 17 years, 3 months. Since this is in fact so close to the mature status that the subsequent changes are very slight, the standard of 17 years, 3 months, for the boys, has been chosen as a basis for comparisons with other ages.

THE ANTHROPOMETRIC DATA

A series of anthropometric measures was taken at the time of the physical examination. These measures were obtained every 6 months throughout the period of data collection, starting in the fifth grade at an average age of approximately 11 years. All measures were made in the nude, using a carefully standardized procedure. Each child was measured independently by two physicians; where measurements disagreed by a centimeter or more, the measurements were repeated. Measuring instruments include an adaptation of Baldwin's (1) paper scale and triangle for height and stem length; the linen tape and wooden calipers described by Franzen (5) for girths and transverse diameters, respectively; and balance scales calibrated in kilograms for weights.

The anthropometric data will be described in more detail in forthcoming publications from the Adolescent Growth Study.

RELATIVE SIZE IN TERMS OF SKELETAL MATURITY

Having set up a standard of "maturity", in terms of a given skeletal age and the physical characteristics which accompany that age, it is possible to convert the anthropometric dimensions at other ages into percentages of "mature" size. The use of percentages expresses the relationship between skeletal and physical growth in terms of the individual's own relative maturity, and eliminates the complicating factor of individual differences in size.[4] If a boy has a given skeletal status, for example that of the average 14 year-old, then what proportion of his adult stature has he attained - how nearly is he "grown up", not only in this but in a variety of physical and physiological traits? In order to investigate this problem, measures obtained at the selected skeletal ages of 16 years, 3 months for girls and 17 years, 3 months for boys are taken as a base. For purposes of convenience, the term "mature" will be used to refer to the status of the subjects at these respective ages. The point which is selected as mature is to a certain extent arbitrary, and although it does not represent exactly the same skeletal status in both sexes, it will be more convenient to use the same term for both, always keeping in mind the sex differences. It should also be borne in mind that for both boys and girls the points selected are so close to maturity that growth changes subsequent to these ages are very minor in nature.

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[4] *Since these computations were made on our material a publication has appeared from the Harvard Growth Study (4) in which the same principle was used. In the Harvard data the latest measure taken was used as 100% and earlier measures were expressed as per cent of adult size as thus determined. This was done primarily in order to obtain an accurate valuation of bone maturity on the sum of 12 diameters of bones in the hand. Although similar computations were made from other data, their significance is not discussed, and only a few individual growth curves occur in the publication.*

Measures made at the time a boy or girl first attained his or her "mature" skeletal age, were assigned a status of 100 per cent.[5] For height, stem length, and bi-iliac diameter, the per cent of this standard measure was then computed for all measures taken on the group at all ages. The resulting percentages give us figures for each child's size, relative to status at maturity.

The average trends of relative size - i.e., per cent of mature size gained at successive ages - are shown in Table 6. A comparison of the means based on chronological age and on skeletal age shows that the two series are almost identical. When the means for the sexes are compared for the same stage of skeletal maturity[6] (i.e., an approximate two-year difference in chronological age), they also are seen to be very similar. For example, at 15.2 years the boys have attained 96.59 per cent of their mature height as compared with the girls at 13.2 years who have attained 96.56 per cent of their mature height.

The striking differences between the chronological age and the skeletal age data are to be found in their standard deviations. When percentage of mature height is classified according to chronological age there is considerable spread of the percentage values except close to the point of maturity. But when skeletal age is made the basis for groupings, the S. D.'s shrink markedly, showing that relative size is much more closely related to skeletal maturity than to chronological age.

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[5] *Because of imperfect reliability of the measures, individual growth-curves for each measure of each child were inspected and where the measurement at the 100 per cent point deviated widely from a child's own growth trend the curve was smoothed (by a 3-point moving average) and an interpolated figure read from the curve was taken as the 100 per cent value. In computing percentages from this value, however, the actual obtained measures were used.*

[6] *The term "skeletal maturity", as used in this paper, refers to the degree of development of the skeleton while "skeletal age" refers to the Todd age standards, which are different for boys and girls. Hence, for the adolescent period under consideration, a boy and a girl of the same skeletal age would differ about two years in skeletal maturity.*

TABLE 6

MEANS AND STANDARD DEVIATIONS (S.D.) OF PER CENT OF MATURE SIZE ATTAINED AT SUCCESSIVE AGES

	BOYS						GIRLS					
	Chronological Age Groupings			Skeletal Age Groupings			Chronological Age Groupings			Skeletal Age Groupings		
Ages	n	Mean	S.D.	n	Mean	S.D.	n	Mean	S.D.	n	Mean	S.D.
					Height							
10.7	38	80.2	2.0				33	87.1	3.0			
11.2	49	81.7	2.2				51	89.0	3.2			
11.7	67	83.1	2.3				65	91.0	3.6			
12.2	67	84.6	2.5				65	93.0	3.2			
12.7	75	86.5	2.9	7	87.5	.8	68	95.0	2.7			
13.2	73	88.6	3.3	21	89.2	1.5	65	96.6	2.2**	16	96.9	.9
13.7	75	90.9	3.5	22	91.4	1.4	71	97.6	1.9**	18	97.8	.4
14.2	71	93.0	3.5	38	93.0	1.7	71	98.0	1.5**	27	98.5	.5
14.7	75	94.9	3.1	47	95.0	1.6	70	99.0	1.1**	37	98.8	.6
15.2	70	96.6	2.4	52	96.8	1.0	66	99.5	.7**	49	99.3	.3
15.7	71	97.9	1.7	58	98.1	.7	64	99.8	.6	53	99.5	.3
16.2	64	99.0	1.1	55	98.9	.6	68	99.9	.4	72	100.0*	.1*
16.7	70	99.5	.8	60	99.6	.3	65	100.1	.3			
17.2	64	100.0*	.6*	55	100.0*	.2*	63	100.2	.3			
17.7	56	100.2	.4	44	100.2	.3	48	100.3	.3			
18.2	29	100.4	.3	34	100.5	.3	12	100.6	.3			
					Stem Length							
10.7	38	80.3	1.8				33	85.3	3.0			
11.2	49	81.0	2.0				51	87.2	3.2			
11.7	67	82.1	2.2				65	88.8	3.6			
12.2	67	83.2	2.4				65	90.3	4.0			
12.7	75	84.8	2.7				68	92.9	3.3			
13.2	73	86.6	3.1	21	87.2	1.5	65	94.7	2.7	16	94.9	1.3
13.7	75	88.8	3.5	22	89.4	1.5	71	96.1	2.6	18	96.0	.8
14.2	71	90.9	3.7	38	91.0	2.0	71	97.2	2.2	27	97.0	1.0
14.7	75	93.2	3.5	47	93.1	1.9	69	98.2	1.8	37	97.7	.8
15.2	70	95.3	2.8	52	95.3	1.3	62	99.0	1.4	49	98.7	1.0
15.7	71	96.9	2.3	58	97.1	1.3	64	99.4	1.3	51	98.9	.8
16.2	64	98.5	1.6	56	98.1	1.0	67	99.9	1.1*	72	100.0*	.3*
16.7	70	99.3	1.2	60	99.2	.7	65	100.1	.7			
17.2	64	100.0	.9	55	100.0*	.5*	62	100.4	.8			
17.7	56	100.3	.7	44	100.3	.4	48	100.5	.6			
18.2	29	100.5	.6	34	100.6	.4	12	100.8	.7			
					Bi-iliac Diameter							
10.7	38	79.8	3.3				33	82.9	4.7			
11.2	49	81.0	2.8				51	85.1	4.4			
11.7	67	82.6	3.0				65	86.8	4.8			
12.2	67	84.5	3.0				65	88.6	4.6			
12.7	75	86.3	3.5				68	91.0	4.4			
13.2	73	88.3	3.6	21	89.2	1.6	65	92.6	4.1	16	92.7	1.8
13.7	75	90.3	3.7	22	90.4	1.6	71	94.3	3.6	18	94.4	1.2
14.2	71	92.6	3.8	38	92.2	2.4	71	95.8	3.1	27	95.1	2.0
14.7	75	94.3	3.5	47	94.6	2.0	70	97.3	3.1	37	96.2	1.7
15.2	70	96.1	2.9	52	96.2	1.9	64	98.2	2.4	49	97.7	1.7
15.7	71	97.6	2.4	58	97.9	1.3	64	99.0	2.4	52	98.6	1.2
16.2	64	99.0	1.5	55	98.7	1.0	67	100.2	1.6	72	100.1*	1.1*
16.7	70	99.4	1.3	60	99.5	.8	65	100.3	1.6			
17.2	64	100.0	1.0	55	100.2*	.5*	63	100.9	1.7			
17.7	56	100.2	1.0	44	100.2	.7	48	100.7	2.2			
18.2	29	100.3	.7	34	100.7	1.0	12	101.3	1.5			

*Distributions not normal because these are at the point chosen as mature status and 100 per cent.

**Skewed distributions because of mature status of some cases.

This relationship is illustrated in the individual curves in Figures 2 to 25, in which per cent of mature size is plotted first in terms of the child's chronological age, then according to his skeletal age. In these charts[7] the line of means is indicated in the center of a shaded area representing ± 1 P.E. from the mean. The horizontal lines from the ordinate, and the vertical lines from the abscissa, terminate at ± 2 P.E. from the mean. The heavy black circles designate the seriatim values for an individual case. The cases selected are among the most extremely deviating boys, Cases F 5 and E 10 are early-maturing, while A 1 and B 20 are late-maturing. A glance at these figures reveals that the most consistent trends are found in height - probably at least in part because it is the most reliable measure.

When chronological age is held nearly constant by grouping the boys into six-month age intervals, r's of skeletal age with absolute height at each age level are all positive, but they gradually diminish at successive ages, from .66 at 13.7 years to .21 at 17.2 years (Table 7). However, when for these same chronological age intervals skeletal age is correlated with the per cent of mature height attained at that time, the r's are above .80 and remain consistently high. For the ages 13.7 through 16.7 they range from .85 to .89. At 17.2 years the r drops to .81. The distribution at this age is not normal because it is the age arbitrarily chosen as 100 per cent. If all of the measures were perfectly reliable one might expect the r at 17.2 to approach 1.00 and at adjacent ages to lie very close to this. But there is some error both in the measurement of height and in the assessment of skeletal age. Furthermore, there is a ceiling, an upper limit in both skeletal age and height when expressed as per cent of mature size. These ceilings restrict the S.D.'s as the upper ages are approached. The combination of restricted range of scores and imperfect reliability results in r's for these ages which are lower than if these attenuating factors were not operative. The same condition holds for the upper ages of the girls for the r's.

The closeness between this relationship of relative height and skeletal age is emphasized by contrasting it with the series of r's between relative height and chronological age when skeletal age is held constant (i.e., is limited to a six-month range). For a given skeletal age, the relation between chronological age and per cent of mature height is small. These r's run from -.06 to + .58, the latter relatively high r being an exception: in general, the r's are of the order of .25.

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[7] *The graphic formulation of these charts was devised by Dr. Harold E. Jones.*

Figure 2

RELATIVE HEIGHT
(Boys)

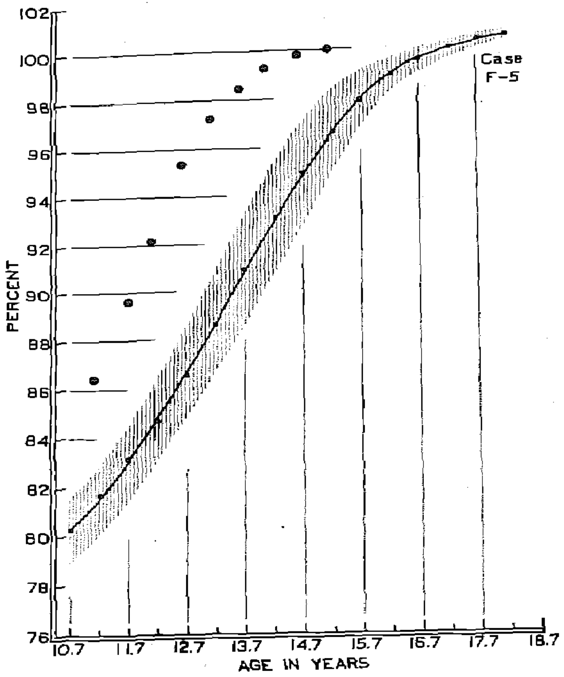


Figure 3

RELATIVE HEIGHT
(Boys)

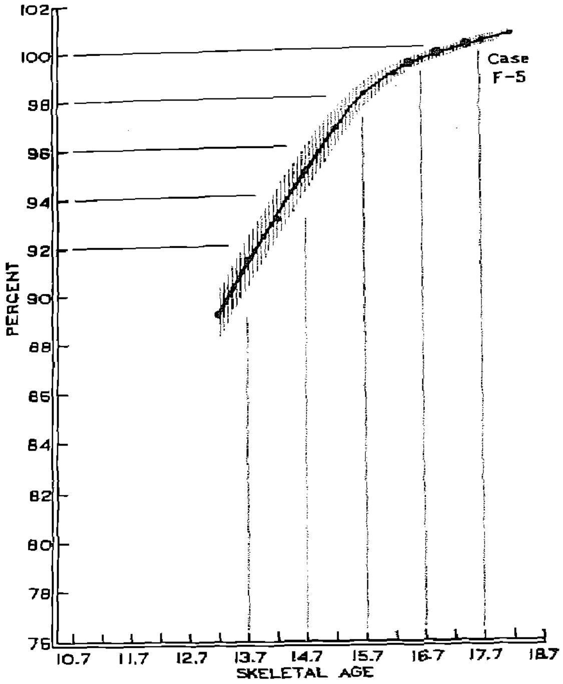


Figure 4

RELATIVE STEM LENGTH
(Boys)

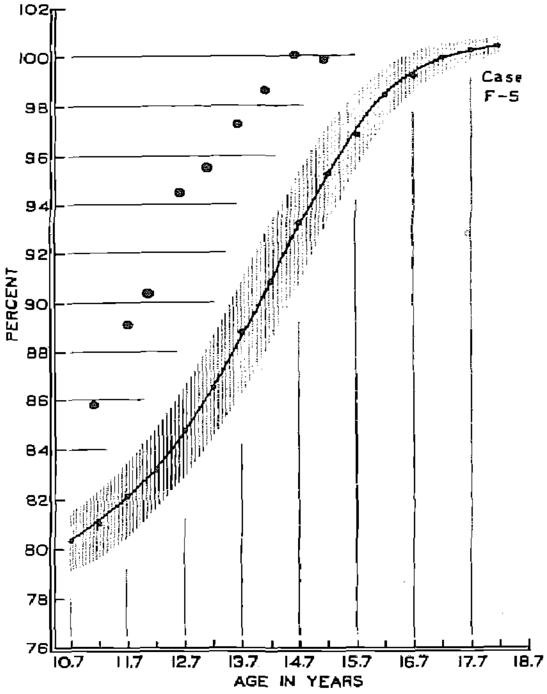


Figure 5

RELATIVE STEM LENGTH
(Boys)

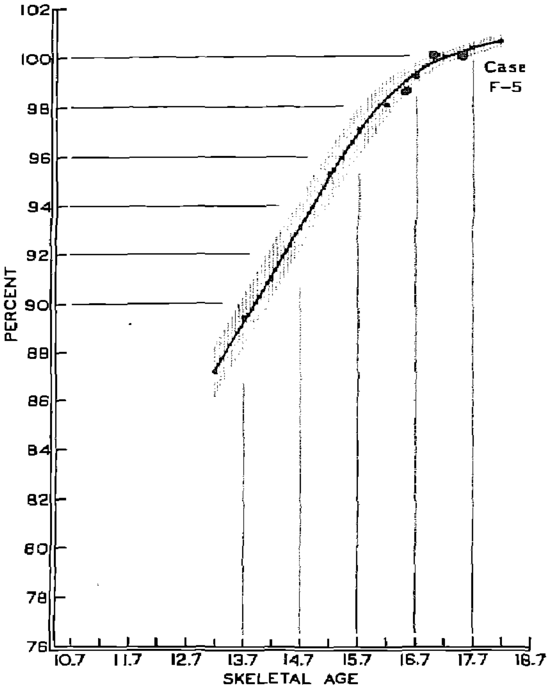


Figure 6

RELATIVE BI-ILIAC
(Boys)

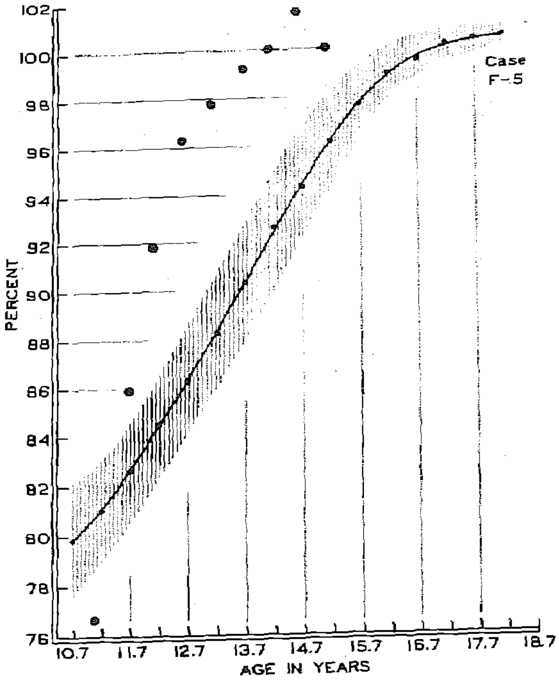


Figure 7

RELATIVE BI-ILIAC
(Boys)

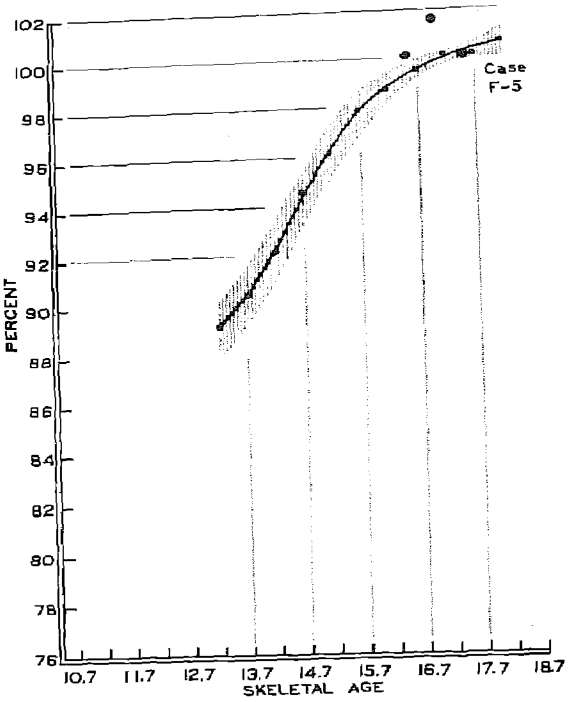


Figure 8

RELATIVE HEIGHT
(Boys)

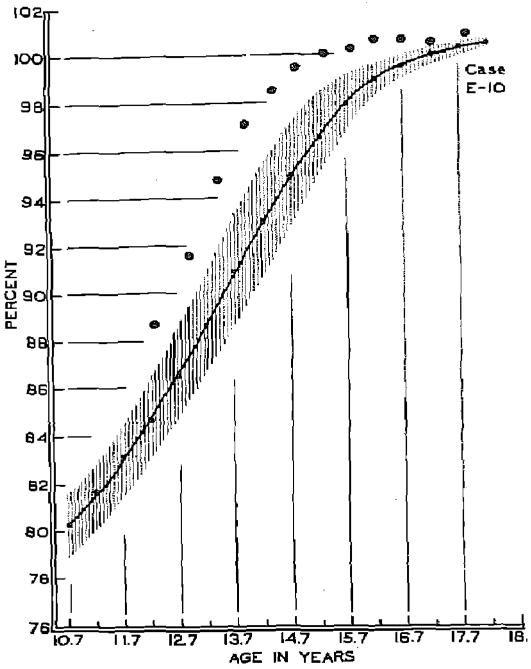


Figure 9

RELATIVE HEIGHT
(Boys)

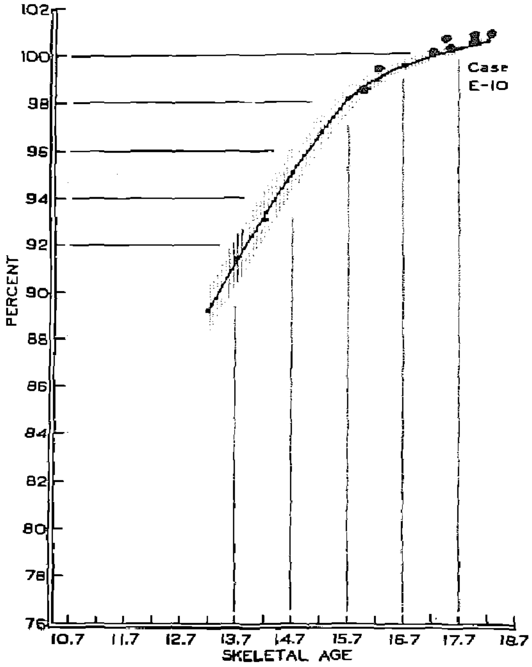


Figure 10

RELATIVE STEM LENGTH
(Boys)

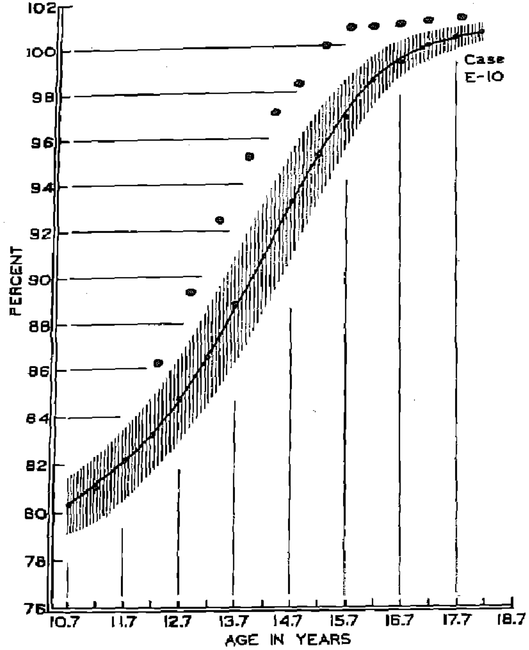


Figure 11

RELATIVE STEM LENGTH
(Boys)

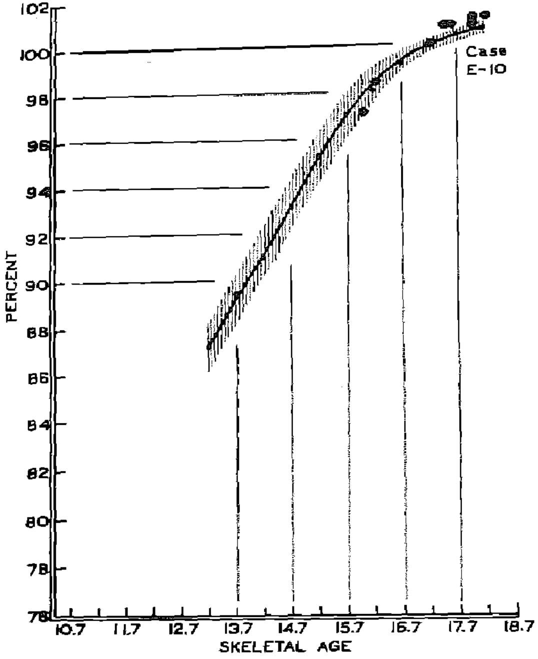


Figure 12

RELATIVE BI-ILIAC
(Boys)

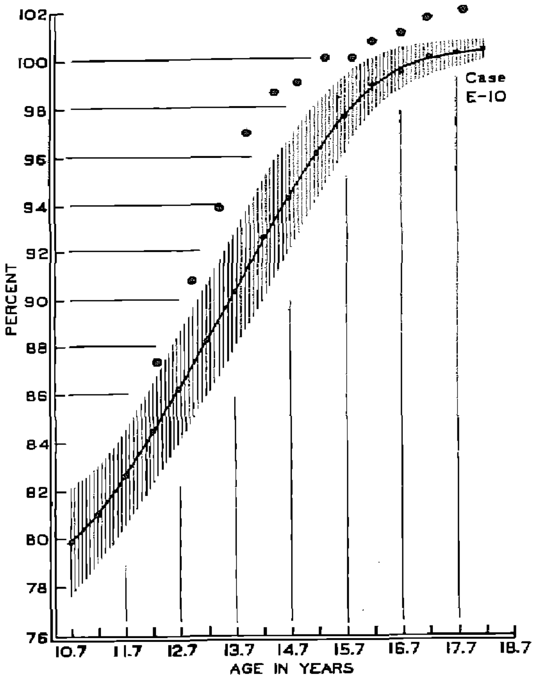


Figure 13

RELATIVE BI-ILIAC
(Boys)

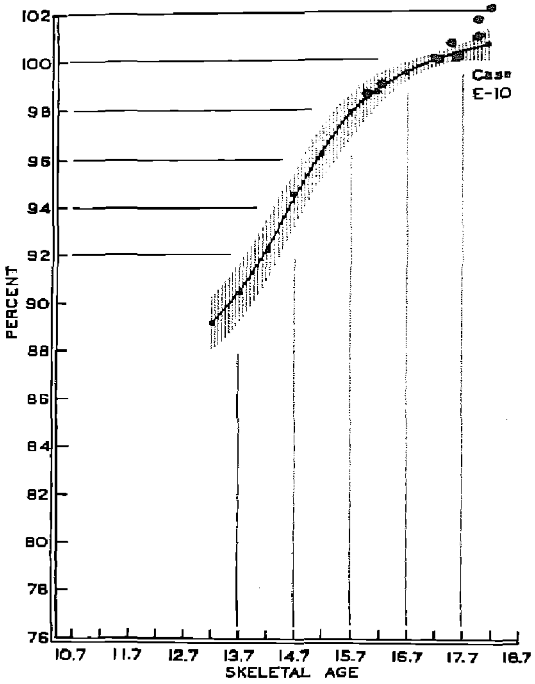


Figure 14

RELATIVE HEIGHT
(Boys)

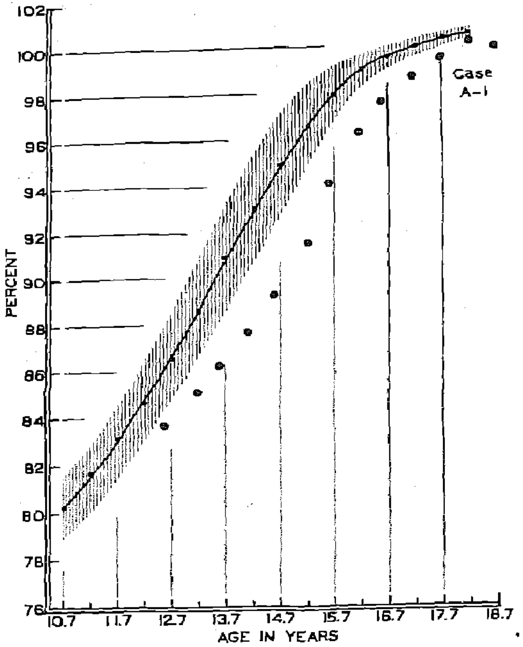


Figure 15

RELATIVE HEIGHT
(Boys)

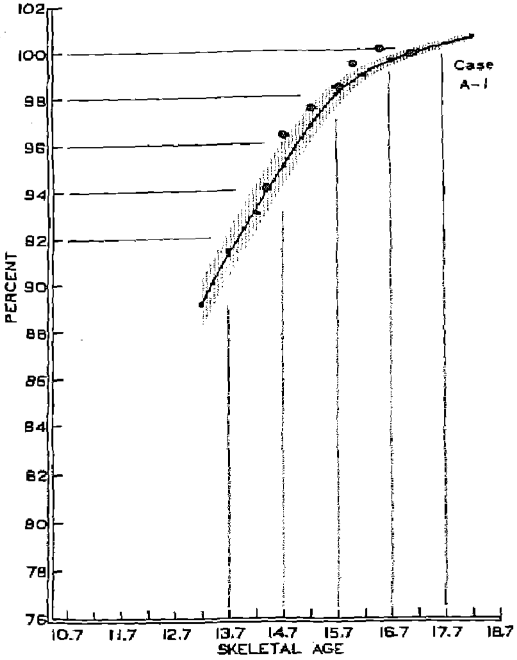


Figure 16

RELATIVE STEM LENGTH
(Boys)

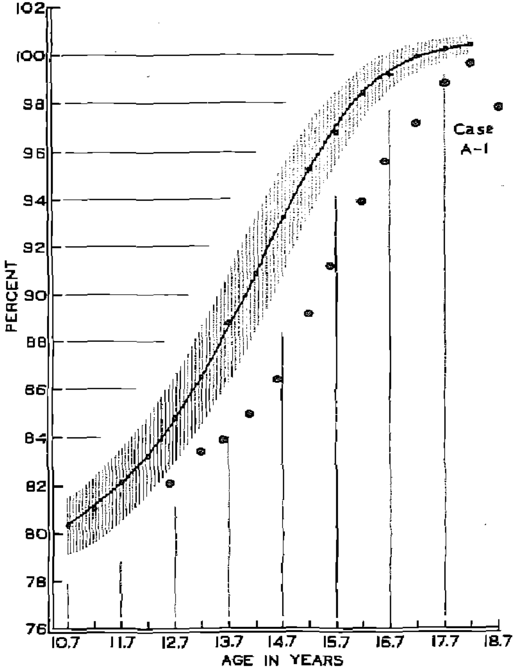


Figure 17

RELATIVE STEM LENGTH
(Boys)

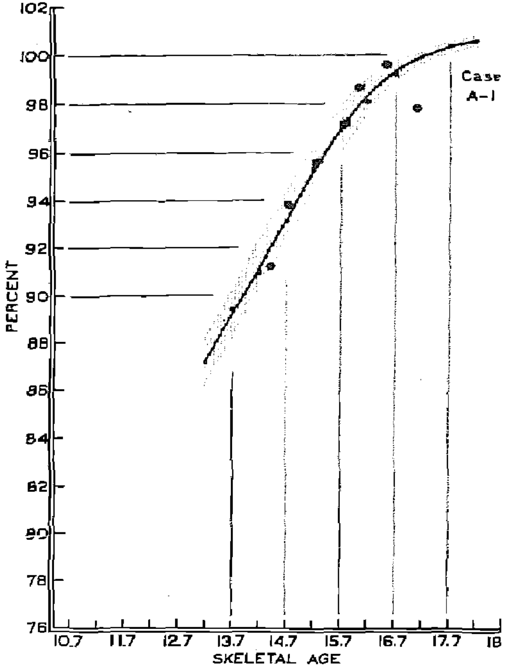


Figure 18

RELATIVE BI-ILIAC
(Boys)

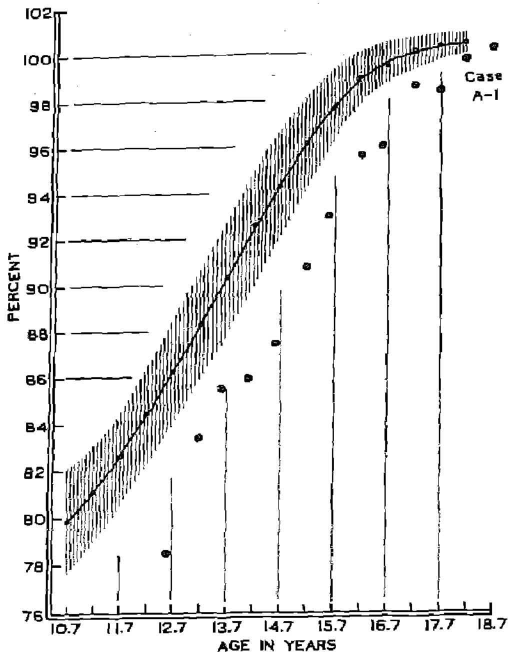


Figure 19

RELATIVE BI-ILIAC
(Boys)

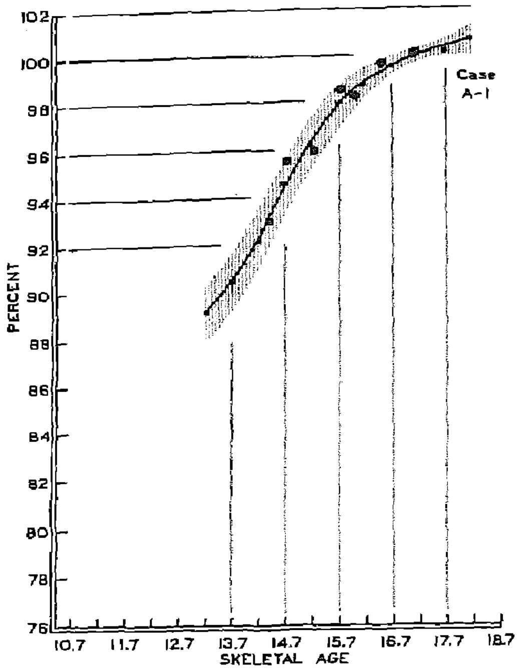


Figure 20

RELATIVE* HEIGHT
(Boys)

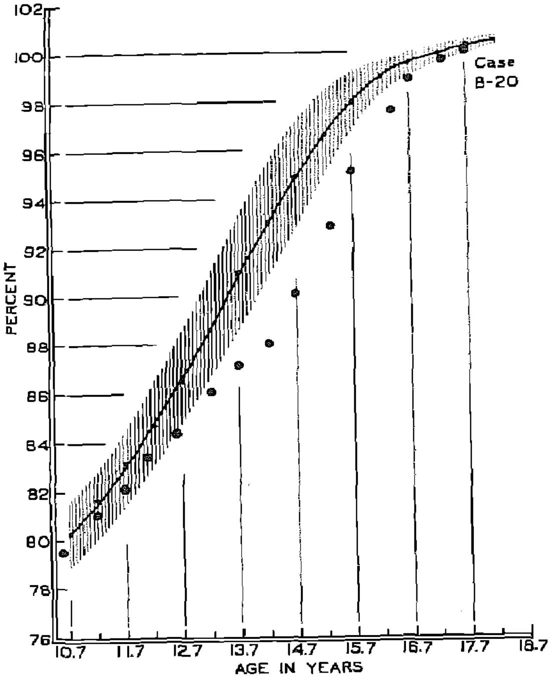


Figure 21

RELATIVE HEIGHT
(Boys)

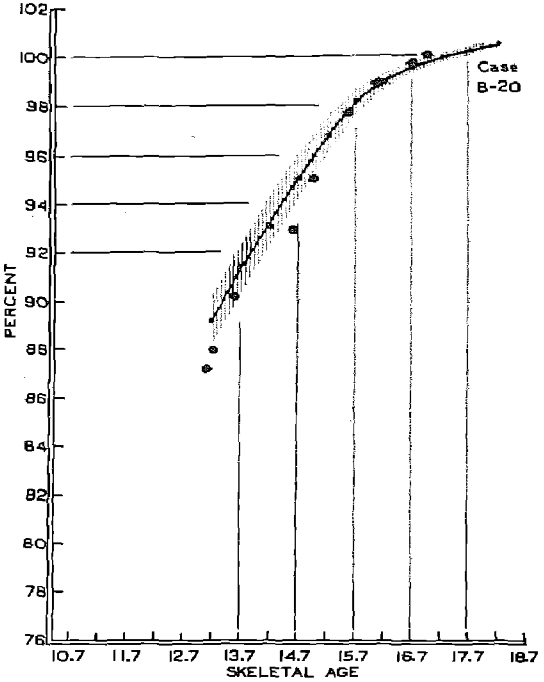


Figure 22

RELATIVE STEM LENGTH
(Boys)

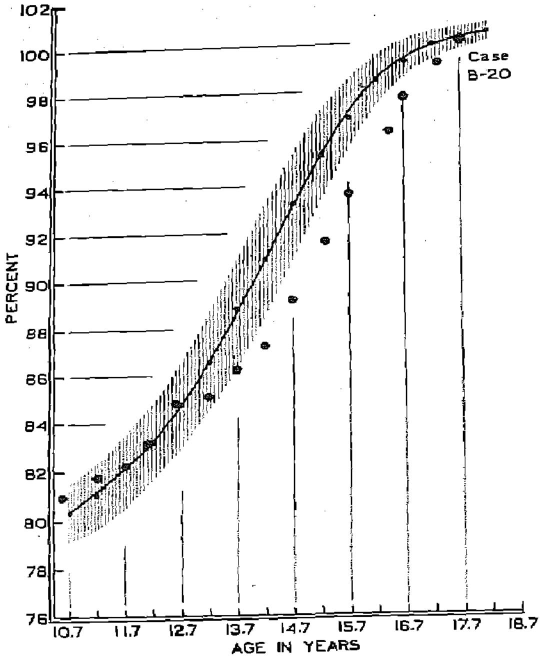


Figure 23

RELATIVE STEM LENGTH
(Boys)

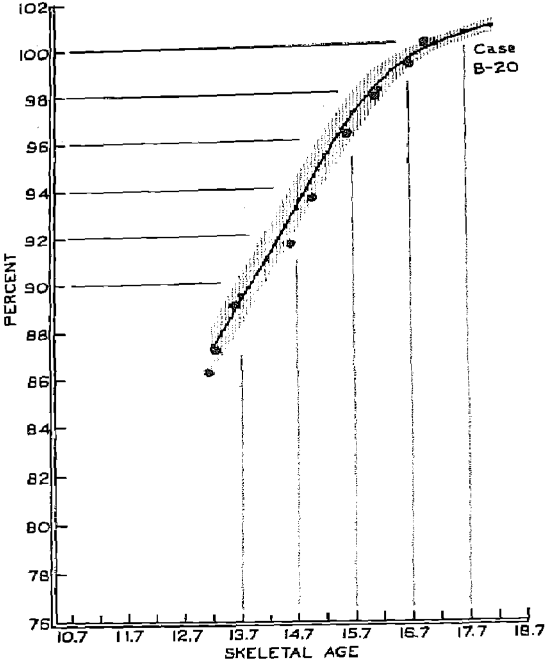


Figure 24

RELATIVE BI-ILIAC
(Boys)

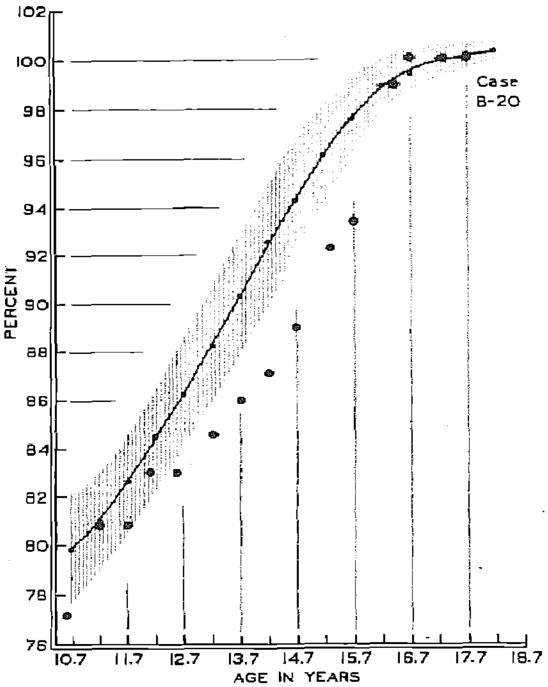


Figure 25

RELATIVE BI-ILIAC
(Boys)

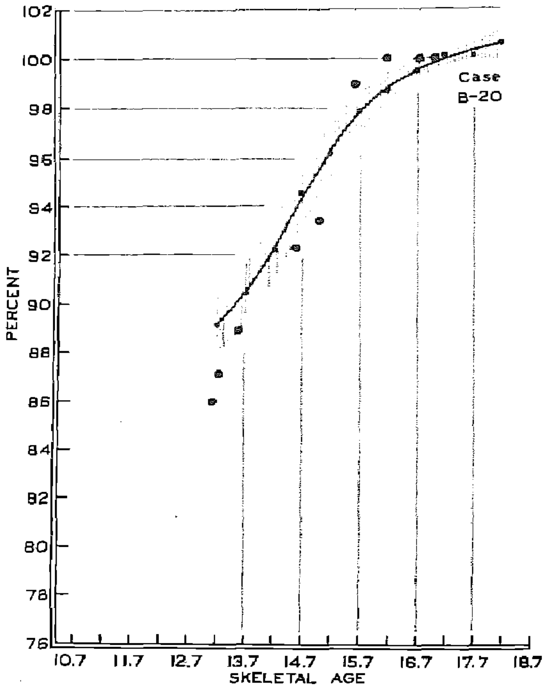


TABLE 7

HEIGHT CORRELATED WITH CHRONOLOGICAL AGE AND SKELETAL AGE

BOYS

		Chronological Age			Skeletal Age
Ages	n	Height in Centimeters by Sk. A. r	Per Cent of Mature Height by Sk. A. r	n	Per Cent of Mature Height by C.A. r
13.2	-	-	-	21	-.04
13.7	34	.66	.88	22	-.06
14.2	61	.64	.88	38	.58
14.7	72	.59	.89	47	.14
15.2	69	.46	.89	52	.24
15.7	71	.40	.86	58	.39
16.2	64	.35	.85	55	.32
16.7	69	.15	.87	60	.27
17.2	63	.21	.81†	**	**
17.7				44	.29
18.2				34	.04
			GIRLS		
13.2	-	-	-	16	-.10
13.7	42	.08	.85	18	.56
14.2	58	.16	.86	27	.46
14.7	65	.07*	.82*	37	.29
15.2	63	-.03*	.82*	49	.02
15.7	53	-.15*	.87*	53	.01

†Not normal, because this age is 100 per cent, and all but smoothed cases fall into one category.

*Skewed distributions because of Sk. A. "ceiling" of 16.2 years. At 15.7 years, if all girls including those who have matured at an earlier age, are used by adding one-half year to the skeletal age for each half year after Sk. A. 16.25, the number of cases becomes 64 and the r between per cent of mature height and skeletal age becomes .89.

**Skewed distributions.

Subjecting the data for the girls to the same correlational analysis (Table 7), we find (over the short age range for which the comparisons can be significantly made) similarly high r's between skeletal age and per cent of mature height. The girls' measures show somewhat less relation than the boys' between absolute height and skeletal age, and a slightly greater relation between per cent of mature height and chronological age. However, when we take into account the small range over which the girls' data are significant it is difficult to say whether these slight sex differences are due to more than chance. The correlations for both sexes are similarly high between per cent of mature height and skeletal age at any chronological age.

Similar relations between per cent of mature size and skeletal age are found for four other measures - stem length, weight, bi-iliac diameter, and chest circumference (Table 8).

TABLE 8

CORRELATIONS BETWEEN SKELETAL AGE AND PER CENT MATURE STEM LENGTH, BI-ILIAC DIAMETER, WEIGHT AND CHEST CIRCUMFERENCE

				BOYS				
C. A.	Stem Length		Bi-Iliac Diameter		Weight		Chest Circumference	
	n	r	n	r	n	r	n	r
13.7	34	.86	34	.77	34	.75	34	.66
14.2	61	.85	61	.77	61	.81	61	.72
14.7	72	.89	72	.86	72	.87	72	.81
15.2	69	.89	69	.80	69	.78	69	.74
15.7	71	.84	71	.77	71	.83	71	.71
16.2	64	.84	64	.74	64	.76	64	.64
16.7	69	.82	69	.66	69	.81	68	.65
17.2	63	.78	63	.53	63	.78	62	.62
				GIRLS				
13.7	42	.85	42	.82	42	.74		
14.2	58	.84	58	.85	58	.66		
14.7	65	.85	66	.74	66	.64		
15.2	61	.86	63	.85	65	.78		
16.7	64	.81	64	.56	64	.50		

The relation to skeletal age is closest for height, then come stem length and weight, with bi-iliac diameter and chest circumference relatively low (r's on the latter range from .62 to .81 for boys). These lower r's might be accounted for in three ways: (a) these last two measures are less reliable than the first three (3, 7); (b) the bi-iliac, being a smaller, less variable measure, does not differentiate size as well as do the other measures. Furthermore, the increments with age are relatively small for both bi-iliac diameter and chest circumference. But (c) it is also possible that the transverse dimensions are not as closely related to skeletal maturity as are the vertical dimensions in which growth of the long bones used in the assessments is more obviously involved. Support for this latter interpretation is given by the r's for weight, as it partakes of both longitudinal and transverse dimensions, and though very reliable, and showing high variability and large increments with age, it falls in between the two types of measure in the size of the correlations. Probably all three factors are operative.

From the evidence thus far presented, we should expect growth in size to be most consistent when expressed in relation to a child's skeletal development. In order to determine whether this is true, we have computed correlations for consistency of height in boys, using 17.2 years as the adult standard with which to compare earlier measurements of height. The resulting r's are shown in Table 9 and Figure 26. Height (in cm.) at C. A. 17.2 is correlated with height at seven earlier ages. These r's, as would be expected, are high at ages near to 17.2, (.98 with height at C. A. 16.7) and drop as the age interval between measures increases (to .83 and .84 at C. A.'s 14.2 and 15.7, respectively). But C. A. 17.2 includes a range of several skeletal age years: half of the boys will have attained their full stature at this age or before, but the others will continue to grow - some of them for several years. Although we can predict height at 17.2 years with fair accuracy at 14 years, this does not mean we can predict adult height with equal accuracy. This is illustrated in the series of r's between height at earlier C. A.'s with "mature" height, that is, height at Sk. A. of 17.2 years. In this series the r's at C. A.'s 13.7 and 14.2 have dropped to .69. However, if we correlate height at earlier skeletal ages with height at Sk. A. 17.2, the r's although they drop to .87 at 14.2 years, are at all ages higher than for the corresponding C. A. groups, and the r between Sk. A.'s 13.7 and 17.2 is .92.

It is of interest to note that the prediction of height is poorest at 14.2 years by all three sets of comparisons. This is usually considered to be the age at onset of puberty for most boys. But it is also an age which is composed of boys of greatly differing physical maturities - due to the combined factors of individual differences in age at puberty and the rapid and marked changes which occur once the growth spurt starts in a child. Development at this stage appears to be more chaotic than at earlier or later stages, and ordinarily related aspects of growth tend to fall out of step with each other. It is not a good age at which to make predictions in boys' height.

Correlations for consistency of height have been computed in a similar way for the girls, using 16.2 years, or complete skeletal maturity, as the basis for comparisons (Table 9). Again, as for the boys, we find that the highest r's occur between skeletal age groups, and that the lowest r's are between mature height at skeletal age 16.2 and height at earlier chronological ages. The r's for the girls are in most instances higher than those for the boys. This may be attributed to the fact that the data for the girls cover a shorter and relatively more mature section of their growth, - a section in which on the average very little growth in height takes place.

To summarize, among boys of the same chronological age, the skeletally more mature boys are nearer their own mature size, the immature boys less near. When size is expressed in terms relative to the boys' own mature size, there is a high relationship, at all chronological ages studied, between skeletal maturity and relative maturity in height; the relation is also high for stem length, somewhat less for weight, and still less,

TABLE 9

CORRELATIONS SHOWING CONSISTENCY OF GROWTH IN HEIGHT

BOYS

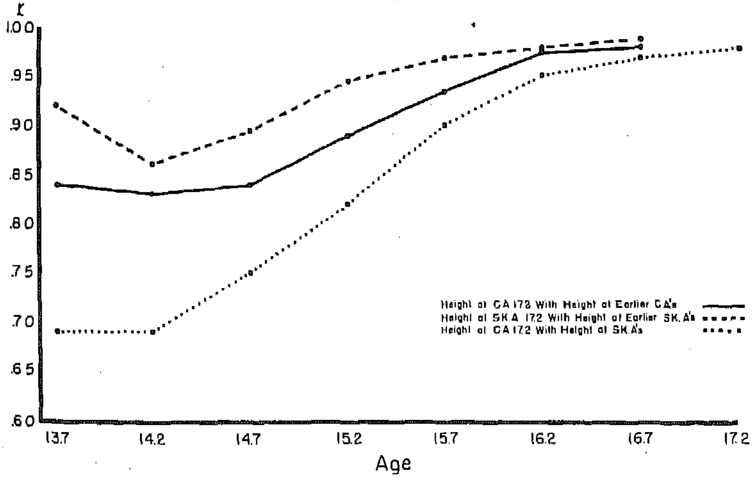
Ages	Ht. at C.A. 17.2 with Ht. at Earlier C.A.'s		Ht. at Sk.A. 17.2 with Ht. at C.A.'s		Ht. at Sk.A. 17.2 with Ht. at Earlier Sk.A.'s	
	n	r	n	r	n	r
13.7	63	.84	77	.69	31	.92
14.2	60	.83	77	.69	49	.87
14.7	63	.84	77	.75	60	.89
15.2	59	.89	76	.82	67	.94
15.7	61	.94	75	.90	73	.97
16.2	56	.98	74	.95	75	.98
16.7	61	.98	73	.97	76	.99
17.2	-	-	68	.98	-	-

GIRLS

	Ht. at C.A. 16.2 with Ht. at Earlier C.A.'s		Ht. at Sk.A. 16.2 with Ht. at C.A.'s		Ht. at Sk.A. 16.2 with Ht. at Earlier Sk.A.'s	
	n	r	n	r	n	r
13.7	67	.88	70	.85	25	.98
14.2	68	.93	71	.90	36	.99
14.7	67	.97	70	.95	47	.99
15.2	64	.98	66	.95	59	.99
15.7	61	.99	64	.95	65	.99
16.2	-	-	68	.98	-	-

Figure 26

Correlations Showing Consistency of Growth in Height
Boys



but definitely positive, for bi-iliac diameter and chest circumference. The small though positive *r*'s between chronological age and percentage of mature height indicate that there is possibly a slight tendency among boys of the same skeletal age for the chronologically older boys to have more nearly completed their growth. Correlations for consistency of growth are highest when computed between skeletal age groups. If one were to attempt to predict a child's mature height, fairly accurate prediction would seem possible from skeletal age. Given his skeletal age, from which per cent of mature height can be estimated, and his height at the time the x-ray was taken, probable mature height, or 100 per cent, can be readily computed. It is just possible that a correction for chronological age would improve the accuracy. That is, as suggested by the *r*'s in the last column of Table 7, late-maturing boys may be relatively taller for their skeletal age. However, data on other samples will be needed to determine whether this is true, generally, and whether such a correction is advisable.

As for the girls, for a given chronological age (above 12 years), there is no relation between absolute height and skeletal age when C. A. is controlled, but again we find a close relation between skeletal age and relative height in terms of per cent of the girls' own mature statures. But among the girls chronological age seems to have some importance, in the earlier ages studied, and accurate prediction of a girl's mature height would seem to be in part also dependent on her chronological age up through about 14 years. Correlations for consistency in absolute height show that prediction of mature height is greater from skeletal age that from chronological age criteria. It must be kept in mind, however, that significant data for the girls are available for only a very short age range. The correlations between skeletal age and per cent of mature stem length, bi-iliac diameter and weight are also positively correlated in the girls, with weight showing the lowest relationships. Probably growth in width of the hips is a more significant indicator of maturing in the girls that it is in the boys because of the sex differences in body build which develop during these ages. However, the differences among the *r*'s of these various measures with skeletal age are small, and may not be significant. In all instances, the *r*'s are strongly positive, although some of them drop considerably at the latest ages, as maturity is approached. The measures which show this drop in *r*'s are, for both sexes, primarily transverse dimensions: the lower *r*'s may be a function of the increased influence, at the level where growth changes are very slight, of the three factors mentioned above. - factors which would account for the lower *r*'s with these measures at all ages. These are: low reliability, insignificant changes with growth, and smaller relationship to the skeletal areas involved.

PER CENT OF MATURE SIZE COMPARED WITH RATES OF MATURING

There is a spread of about 4 years in the ages at which the boys in this study reach a skeletal status of 17 years, 3 months: and a spread of an estimated 3.5 years in the girls' ages at reaching complete epiphyseal closure. In several researches in recent years it has been shown that various factors in physical maturing are related to rates of bone development. As there is some slight correlation between C. A. and growth in size we may find some characteristic differences in the growth trends of slow and fast maturers. A number of investigators, for example Shuttleworth (9), and Richey (8), have used such developmental landmarks as menarche and age at most rapid growth as criteria for grouping children according to their relative maturity. They have then compared early-, average-, and late-maturing groups in various ways. We have approached this problem by dividing all of the children into early-, average-, and late-maturing groups on the basis of their skeletal maturity. The girls are classified in three groups, according to the age at which they first reached the skeletal age of 16 years, 3 months; and the boys are divided similarly, according to the age at which they attained the skeletal age of 17 years, 3 months. The division has been made so that for both sexes the means of the chronological ages for the three maturity groups are approximately one year apart at maturity, with the girls of each group being advanced about two years over the boys in the corresponding group. The number of cases for the early-, average-, and late-maturing groups, respectively, are for the girls, 25, 27, and 19; for the boys, 21, 35, and 21. The data in Table 10 show that the skeletal age differences between the groups are maintained over the age period for which we have x-rays.

Let us compare the relative growth rates of these early-, average-, and late-maturing groups. The means and S.D.'s for per cent of mature height are shown for these groups in Table 11; the means have been plotted, with the curves adjusted to make skeletal maturity in the groups approximately equivalent, in Figures 27 and 28. It is evident from the table that, for their C. A.'s, the late-maturing groups are retarded and the early-maturing groups accelerated in growth relative to their eventual mature height. However, the adjusted curves show in both sexes a tendency for the late-maturing groups to be relatively nearer mature height for their skeletal ages than the early-maturing groups, though the differences are not significant. It appears from these curves, as well as from the correlation coefficients, that if we wish to predict mature height as early as 13 or 14 years of age, accuracy of prediction might be increased if deviations from the average age of maturing were taken into account.

TABLE 10

MEANS AND STANDARD DEVIATIONS (S.D.) OF SKELETAL AGE SCORES AT GIVEN CHRONOLOGICAL AGES OF GROUPS DIVIDED ACCORDING TO AGE AT REACHING MATURE SKELETAL STATUS

	Early-Maturing			Average-Maturing			Late-Maturing		
C.A.	n	Mean	S.D.	n	Mean	S.D.	n	Mean	S.D.
				BOYS					
13.7	7	14.9	.37	16	13.7	.52	6	13.1	.45
14.2	14	15.4	.55	28	14.1	.52	17	13.5	.52
14.7	18	15.9	.56	31	14.6	.57	17	13.8	.46
15.2	19	16.5	.59	34	15.3	.55	20	14.4	.56
15.7	14	16.8	.51	33	15.8	.49	21	15.0	.43
16.2	17	17.2	.51	33	16.3	.40	17	15.5	.39
16.7	15	17.8	.40	32	16.8	.43	20	15.9	.44
17.2	17	18.0	.24	31	17.4	.45	19	16.4	.33
				GIRLS					
13.7	12	15.0	.77	14	13.7	.38	8	13.2	.46
14.2	19	15.6	.54	23	14.5	.51	14	13.5	.66
14.7	23	16.0	.40	26	15.0	.50	19	14.0	.65
15.2	25	16.2*	.23*	26	15.4	.45	16	14.6	.53
15.7	25	16.2	-	22	15.8	.37	18	15.0	.50

*Three previously mature cases placed at 16.5 Sk.A.

FACTORS AFFECTING GROWTH IN INDIVIDUAL CASES

Other possible factors which might influence growth in size, apart from skeletal age, may be discovered through an examination of the relative growth rates of individuals. In the comparison of growth rates we may consider a number of hypotheses, one of which pertains to the health of the subjects in question. If illness should retard growth in size but not the process of skeletal maturing (10), then we might expect poorer prediction from those cases who have had the most severe illnesses. Todd took care to emphasize in his norms the areas of the skeleton which he regarded as least affected by disturbances in health. It seems possible, therefore, with the skeletal ages based on his norms, that we may find periods of delayed growth in size with little or no retardation in skeletal maturing. This condition could be investigated in three ways: (a) by selecting those cases for whom prediction is poorest and investigating their health histories; (b) by selecting children with histories of illness and poor health, and then examining the growth rates of their relative (per cent mature) size; or (c) by examining the x-rays for indications of interruptions in growth.

The greatest inaccuracies in prediction occur, of course, at the ages most distant from the terminal point used as 100

TABLE 11

MEANS AND STANDARD DEVIATIONS (S.D.) OF PER CENT OF MATURE HEIGHT FOR EARLY, AVERAGE, AND LATE-MATURING CHILDREN GROUPED ACCORDING TO C.A. AT REACHING COMPLETE SKELETAL MATURITY

BOYS

C.A.	Early-Maturing n	Early-Maturing Mean	Early-Maturing S.D.	Average-Maturing n	Average-Maturing Mean	Average-Maturing S.D.	Late-Maturing n	Late-Maturing Mean	Late-Maturing S.D.
10.7	7	83.2	.9	19	80.0	1.3	12	79.2	1.6
11.2	13	83.5	2.0	24	81.6	1.5	12	80.0	1.8
11.7	19	85.3	2.5	30	82.9	1.4	18	81.3	1.3
12.2	16	87.4	2.8	33	84.4	1.4	18	82.5	1.5
12.7	20	89.6	3.0	35	86.2	1.5	20	83.8	1.5
13.2	19	92.3	2.0	34	88.4	1.7	20	85.4	1.6
13.7	21	94.8	2.4	33	90.7	1.9	21	87.0	1.6
14.2	19	96.9	1.8	32	93.2	1.9	20	88.9	2.0
14.7	20	98.1	1.4	34	95.3	1.6	21	91.2	2.0
15.2	17	99.0	.9	34	97.0	1.2	19	93.6	2.0
15.7	17	99.5	.5	33	98.4	.7	21	95.9	1.5
16.2	15	100.1	.4	31	99.2	.5	18	97.8	1.0
16.7	16	100.2	.4	34	99.8	.3	20	98.6	.7
17.2	15	100.6	.5	29	100.1	.2	20	99.3	.5
17.7	14	100.6	.3	23	100.3	.2	19	99.9	.4

GIRLS

C.A.	Early-Maturing n	Early-Maturing Mean	Early-Maturing S.D.	Average-Maturing n	Average-Maturing Mean	Average-Maturing S.D.	Late-Maturing n	Late-Maturing Mean	Late-Maturing S.D.
10.7	12	89.6	2.4	12	86.5	2.3	8	84.6	1.8
11.2	17	91.8	2.3	23	88.8	2.5	11	85.2	1.4
11.7	23	93.9	2.5	24	91.0	2.5	18	87.3	1.9
12.2	22	95.6	2.3	25	92.8	2.3	18	90.0	2.1
12.7	25	97.2	1.6	26	95.1	1.6	17	91.8	2.0
13.2	22	98.2	.9	25	96.9	1.1	18	94.3	2.3
13.7	24	98.9	.9	27	98.0	.7	20	95.6	2.3
14.2	25	99.4	.5	27	98.7	.5	19	96.8	1.8
14.7	25	99.8	.3	26	99.0	.8	19	97.9	1.2
15.2	23	100.0	.2	25	99.5	.4	18	98.7	.9
15.7	24	100.2	.3	22	99.8	.2	18	99.2	.6
16.2	23	100.2	.3	27	99.8	.2	18	99.4	.2
16.7	22	100.3	.3	25	100.1	.2	18	99.7	.2
17.2	22	100.4	.2	22	100.2	.2	19	99.9	.2
17.7	18	100.5	.2	15	100.2	.2	15	100.1	.2

per cent. Furthermore, if we would predict adult height we should like to do so at the earliest possible ages. We have, therefore, selected for consideration all cases who deviate 1 S. D. or more from the means (of per cent of mature height) for the skeletal ages of 13.2, 13.7, and 14.2 years. There are 16 boys and 15 girls who fall into this deviate category at least once in the three age levels. If prediction of mature height were attempted at 13 to 14 years on these cases, using the method suggested on page 32, there would be considerable error in the estimates.

Figure 27

Percent Mature Height Attained by Early, Average and Late Maturing Girls Adjusted for Skeletal Age

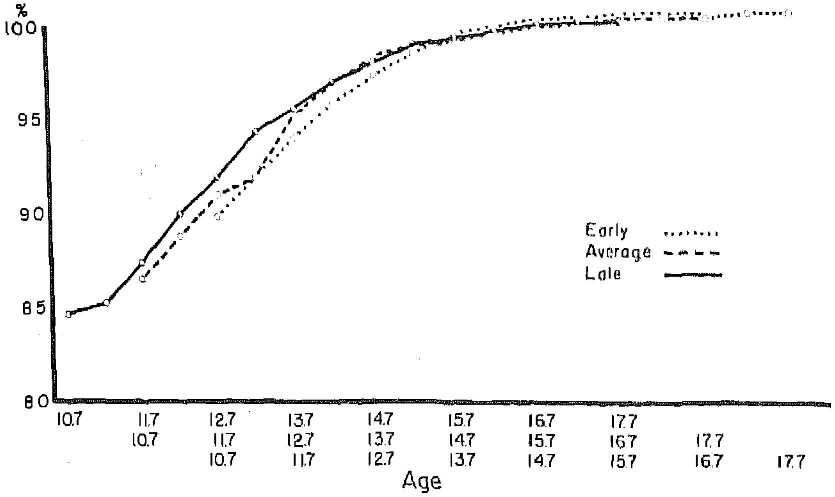
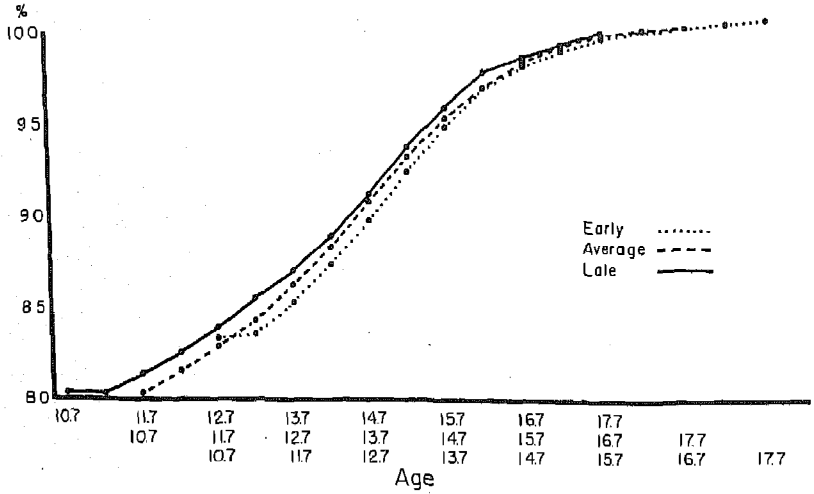


Figure 28

Percent Mature Height Attained by Early, Average and Late Maturing Boys Adjusted for Skeletal Age



Of the 16 boys in this group, 7 are late-maturing, 9 are average-maturing, and none early-maturing. Nine deviated below the mean and 7 above: i.e., mature height would be underestimated for 9 and overestimated for 7. Among the average-maturing boys, 5 are above the mean, 4 are below; of the late-maturing cases, 5 are below and only 2 above. There is a slight suggestion here that the eventual height of the late-maturing boys is more likely to be underestimated, while the height of the early-maturing boys can be predicted most accurately. Inspection of the growth curves of these deviates reveals that in some instances the error in prediction may have been due to error in measuring height at maturity, or in the skeletal age used as a standard.[8] In most instances (10 of 16 boys) even though deviation from the skeletal age norm seems to be large, it is much closer than to the chronological age norm, and even though prediction from skeletal age seems poor, it is a considerable improvement over prediction from chronological age.

The 15 girls who deviate widely show a similar selection. Nine are late-maturing, 5 are average-, and only one early-maturing. The deviations of 7 are above the mean (cases in which mature height would be overestimated) and 8 are below (cases who would be underestimated). Of the average-maturing girls, 2 are below and 3 above the mean; of the late-maturing girls, 5 are below and 4 above; the one early-maturing girl is below the mean. In terms of age at maturing there is no selective factor operating toward either over or under estimating mature height.

In general, for both sexes prediction seems best for the early-maturing cases; among the girls there is some indication that it is poorest for the late-maturing. This difference may be no more than is to be expected from the fact that prediction becomes less accurate as the deviation from maturity increases. This decrease in accuracy of prediction with longer intervals from maturity is indicated in the r's for consistency shown in Table 9.

It seemed possible that these poor-prediction cases (ruling out those which appear to be the result of errors in measurement or assessments) might be generally uneven in their relative maturity in different growth processes. For example, the deviate girls might also be more than ordinarily deviate in age at menarche as related to their skeletal age. If this were true we might expect the skeletal age deviation from menarche to be greater for this group of girls than for an average group. A study of these cases showed no tendency in this direction. Nor is there any consistent directional tendency for menarche to deviate with the relative height deviations. The mean age at menarche is a little late (13.9 years S. D. .91) as compared with 13.2 years (S.D. 1.31) for the entire group, but this is to be expected in a group which is predominantly late-maturing.

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[8] *17.2 years represents the mid-point of a six-month interval of skeletal ages. An individual might fall at the extreme of this interval, or he might, during the six months between taking x-rays, have matured so rapidly as to have missed this interval entirely. In the latter case heights and skeletal ages had to be interpolated between the preceding and succeeding ages and measures.*

An example of a relative growth rate which shows wide deviation from the mean in terms of his skeletal age is Case A 15 (Figures 29 and 30). An attempt to predict his mature height at 14 years would have resulted in considerable underestimation. His skeletal deviations from his chronological age show him to have been about average at the first two x-rays, at 14.0 and 14.5 years, but with a slowing down of rate of skeletal maturing which continues to 17.1 years, after which he again spurts and by 18.1 years is only .4 of a year retarded. An inquiry into the health factors which might have disturbed his growth revealed that during this period he underwent an operation on his breasts because of tumorous growths.

It is also possible that growth rates are influenced by glandular dysfunctions. (Case A 15 may be an instance.) Among the cases in this study there are none with marked glandular disturbance, but the physician[9] who examined them has selected 6 boys in the study who at some part of their adolescent growth period were considered to be physically "sex-inappropriate", with atypical distributions of fat and other physical characteristics which would indicate a temporary glandular dysfunction. Three of these boys are late-maturing, 2 are classed as average, but tend at most ages to be slightly retarded skeletally, while one is at most ages somewhat accelerated, but not markedly so. If their condition is due to a temporary gonadal dysfunction, it might be expected that during this period epiphyseal union would be delayed while the processes of growth in size would continue at the rate customary for that stage of skeletal development. This would result in an eventual height well above the expectancy based on data secured before the disturbance occurred. An examination of the relative growth curves of these boys indicates that this supposition may be true to some extent. Data on per cent of mature height are available for 5 of the boys (one did not attain sufficient bone maturity within the period of the study). Of these 5, 2 are close to the mean at all ages while 3 deviate at least to some extent in the expected direction. For 2, the deviation is slight and for

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[9] *Dr. Herbert R. Stolz.*

Figure 29

RELATIVE HEIGHT

(Boys)

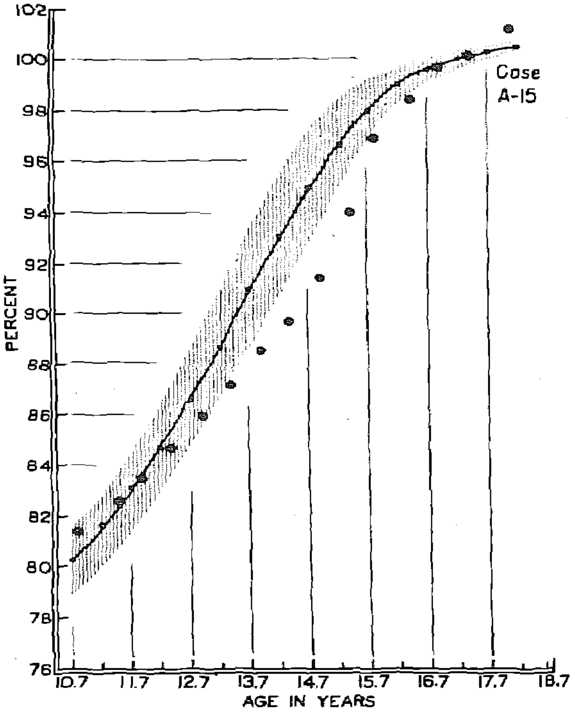
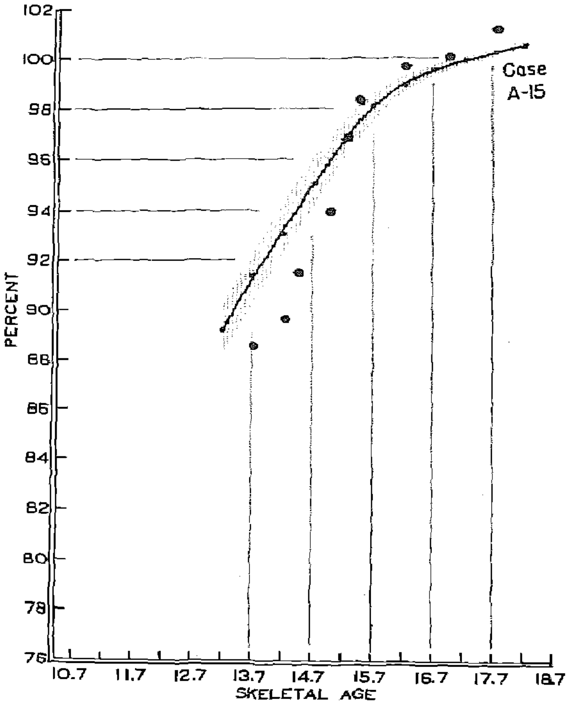


Figure 30

RELATIVE HEIGHT

(Boys)



one, considerable. That is, in the early part of their skeletal age ratings, height is relatively short, and prediction at those ages would have been for a shorter adult height than was attained. However, 3 out of 5 cases is only suggestive, and further data on a much larger number of cases would be necessary to test adequately such an hypothesis as here suggested.

A search for conditions in the bone which might be related to interruptions in growth revealed, among the boys, 5 cases with clear, marked transverse lines which are considered to be indicative of temporary cessations of growth. There were, in addition, 17 cases with light, sometimes barely discernible transverse lines, and 11 cases with slight anomalies of the bones (blurred edges, poor mineralization, areas of decalcification, and fractures), a total of 33 cases.

Among the 16 boys for whom prediction of height was poor, only 6 are in this group of 33, and only 2 are among the 22 with transverse lines. It appears that illnesses which temporarily disturb the growth of the bones do not operate to make prediction of adult height poorer.

There is some indication, however, that factors which have caused the transverse lines found in the bones have operated to delay skeletal maturing as well as growth in size. The 22 cases with transverse lines are divided into maturity groups as follows: 2 early, 10 average, and 10 late maturers - a definitely skewed distribution. Furthermore, among the 5 with definite transverse lines there are no early maturers, but 3 are average and 2 late. Even though Todd selected for his criteria of maturing, areas which he found to be least subject to disturbance, there appears still to be some connection between slower maturing and evidences in the bones of interrupted growth (11). Our x-rays do not by any means catch all of the indications of retardation in growth, because they are restricted to only two areas of the skeleton, and to only the last few years of the children's growth.

As a tentative conclusion, it would appear from this comparison that illnesses may affect rates of growth, both in size and in maturity of the skeleton, and that these changes are likely to be concurrent.

THE SEXES COMPARED FOR RELATIVE GROWTH RATES

So far the discussion in this section has been in terms of the sexes taken separately. Absolute rates of maturing in the sexes differ markedly and this sample is no exception (Figures 31, 32, 33, and 34). To what extent are the relative growth rates similar when adjustment is made to make bone maturity equivalent? In Figure 35 the boys' and girls' per cent mature height curves are plotted with the ages adjusted to approximate equivalence in skeletal maturity. Figure 36 gives the curves

Figure 31

Average Curve of HEIGHT

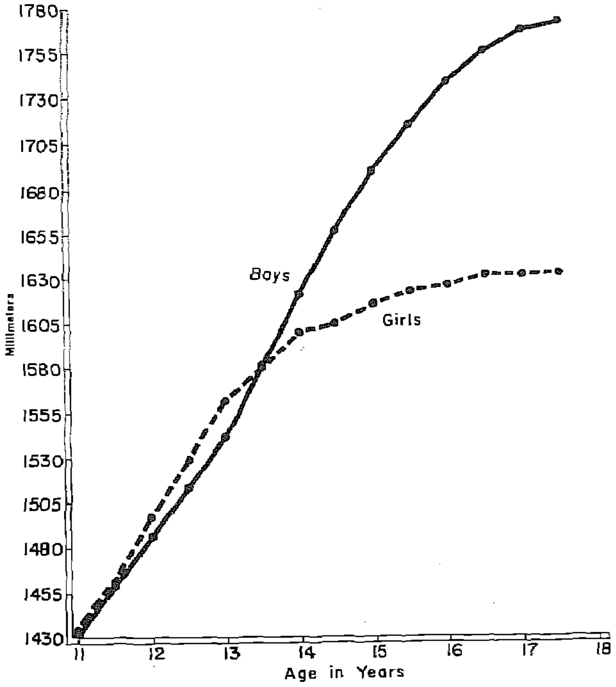


Figure 32

Average Curve of STEM LENGTH

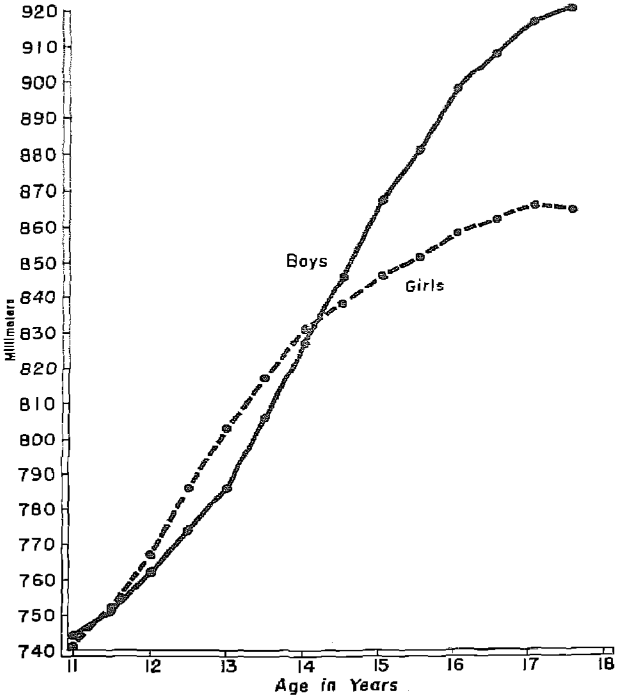


Figure 33

Average Curve of
BI-ILIAC

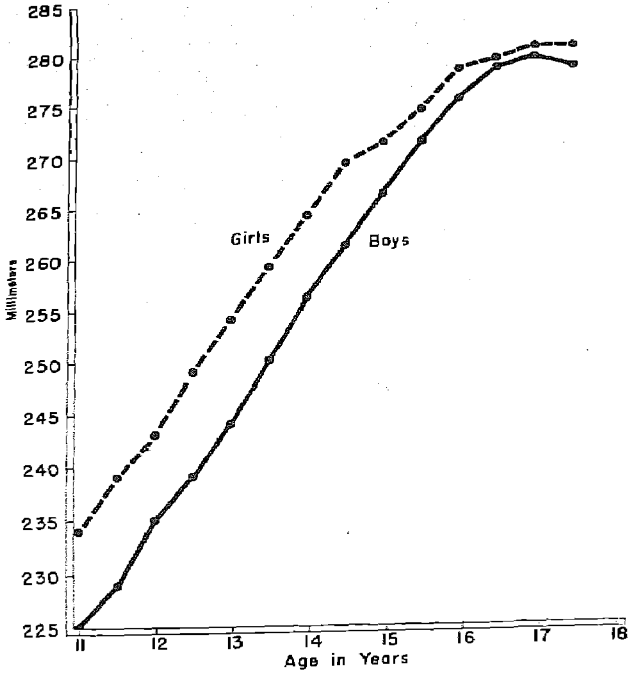


Figure 34

Average Curve of
BI-ACROMIAL

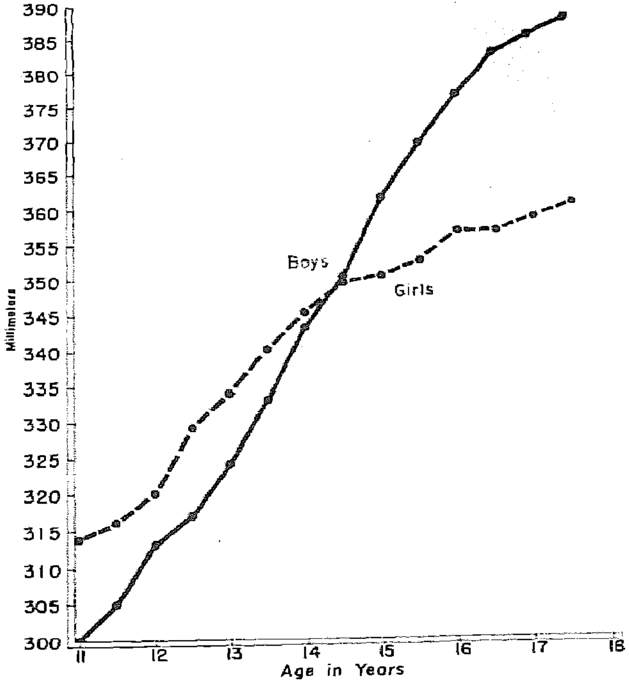


Figure 35

Percent of Mature Height

Sexes Compared on Basis of Equivalent Bone Development

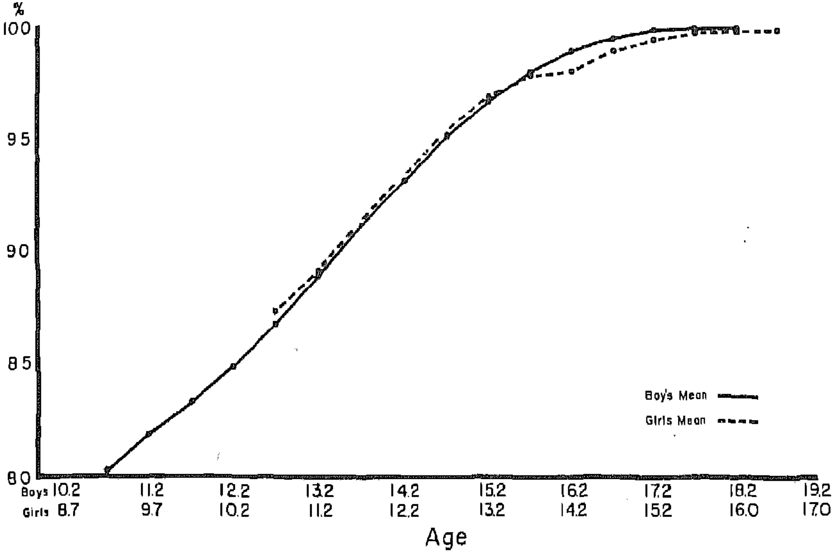
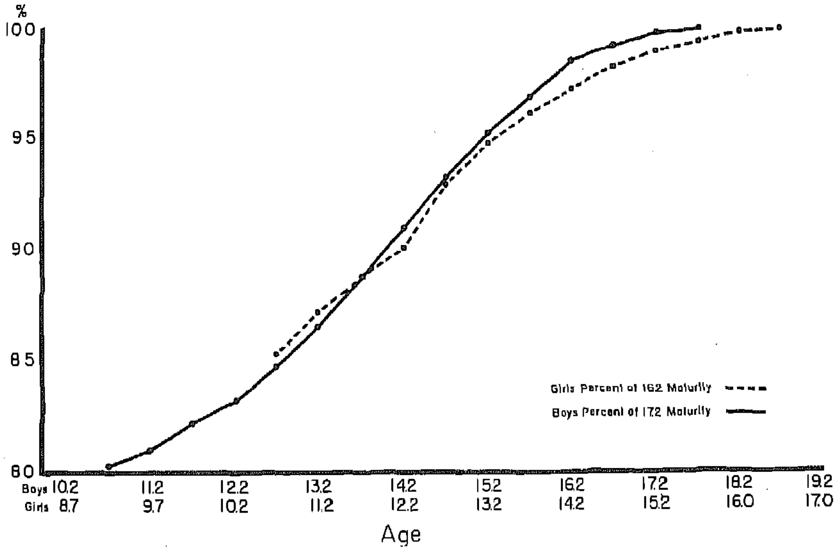


Figure 36

Percent of Mature Stem Length

Sexes Compared on Basis of Equivalent Bone Development



for stem length plotted in the same way. In both measures the curves for the sexes are very similar, but there is some indication that the girls are more nearly their mature size in the early half of the curve. This would be more apparent if the percentages for both sexes had been computed from complete skeletal maturity. As it is, the 100 per cent point for boys lacks a year of being complete. If the percentages were directly comparable the curves would not cross, but would tend to coincide at the later ages.

SUMMARY

The left hands and knees of a group of adolescent children, 90 boys and 87 girls, were x-rayed nine times at six-month intervals (at average ages of 14 to 18 years). Anthropometrics were taken at the same ages. Assessments of bone maturity, by means of the Todd standards, proved to be reliable. Skeletal ages based on the combined hand and knee assessments showed fairly consistent growth trends, the r for boys between ratings three years apart being .80.

Comparisons have been made between skeletal maturing and rates of growth in size. When expressed as per cent of a child's eventual mature size, his growth is seen to be very closely related to the development and maturing of his skeleton. This is shown to be true for the group as a whole, in several different ways. Standard deviations from the mean are seen to be much smaller when the cases are grouped according to skeletal age than when grouped according to chronological age. Correlations between different measures at each age group give higher r's with skeletal age, and when expressed as per cent of mature size. Correlations for consistency in height over a period of years are greater between skeletal age groups. This also holds when comparisons are made among children who mature at different rates, though the late maturers seem to be least predictable - perhaps only because they are farther from their goal at any given C. A. In individual cases whose percentage height is not closely related to skeletal age, we could find little evidence that the disparity was due to other than chance factors. However, there is some indication that illness and glandular hypofunction may operate to retard skeletal maturing and to effect growth in size.

When curves of growth are expressed as per cent of mature size at successive skeletal ages, we find a slight tendency for the late maturers to be a little nearer their mature height and the early maturers a little less so than the average - indicating a slight influence of other factors related to chronological age. When the sexes are compared in this way their curves of growth are seen to be remarkably similar.

It appears that growth in size is closely related to the maturing of the skeleton. At a given skeletal age we may say that a child has achieved a given proportion of his eventual adult body dimensions. Consequently, mature size can be predicted with fair accuracy if a child's present size and skeletal age are known.

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ACKNOWLEDGMENTS

This study is based on a portion of the data assembled in the Adolescent Growth Study of the Institute of Child Welfare of the University of California.

I am indebted to the children who served as subjects, and to the members of the staff of the Adolescent Growth Study. I wish to acknowledge, especially, the contributions of Dr. Herbert R. Stolz who planned the program of physical examinations and anthropometric measurements, and who participated in the program of data collection. Dr. Harold E. Jones and Dr. Herbert S. Conrad have given valuable assistance in suggestions for the research, and in critical reading of the manuscript.

Assistance in the preparation of the materials was furnished by the personnel of the Works Progress Administration, Official Project 665-08-3-30 A26.

SIZE AND BODY BUILD OF ADOLESCENTS IN RELATION TO RATE OF SKELETAL MATURING

by

NANCY BAYLEY

CONTENTS

LIST OF TABLES 48

LIST OF FIGURES 48

INTRODUCTION 51

GROWTH RATES AND BODY BUILD OF EARLY-, AVERAGE-, AND LATE-MATURING GROUPS 54
- a. Girls 54
  - In relation to chronological age 54
  - In relation to skeletal age 56
- b. Boys 63
  - In relation to chronological age 64
  - In relation to skeletal age 64

INDIVIDUAL CASES 74
- a. Racial deviates 75
- b. Individual builds in relation to rate of maturing: Boys 78
- c. Individual builds in relation to rate of maturing: Girls 82

SUMMARIZATION OF SEX DIFFERENCES AND SIMILARITIES 83

SUMMARY AND CONCLUSIONS 86

REFERENCES 89

ACKNOWLEDGMENTS 90

LIST OF TABLES

1. Means and S. D.'s of four anthropometric dimensions for groups divided on the basis of age at reaching skeletal maturity: Girls........ 52
2. Means and S. D.'s of skeletal age scores at given chronological ages of groups divided according to age at reaching mature skeletal status........ 59
3. Critical ratios between means of early- and late-maturing girls for four anthropometric measures, when adjusted to equivalent skeletal maturity........ 60
4. Means and S. D.'s of three anthropometric indices for groups divided on the basis of age at reaching skeletal maturity: Girls........ 61
5. Means and S. D.'s of four anthropometric dimensions for groups divided on the basis of age at reaching skeletal maturity: Boys........ 63
6. Means and S. D.'s of boys' $\frac{\text{bi-iliac}}{\text{height}}$ index grouped according to age at reaching skeletal maturity........ 69
7. Critical ratios between means of early-, average-, and late-maturing groups of boys, when adjusted to equivalent skeletal ages........ 70
8. Means and S. D.'s of $\frac{\text{bi-iliac}}{\text{biacromial}}$ index for groups divided on the basis of age at reaching skeletal maturity: Boys........ 71
9. Means and S. D.'s of $\frac{\text{stem length}}{\text{height}}$ index for groups divided on the basis of age at reaching skeletal maturity: Boys........ 72
10. Anthropometric data for early-, average-, and late-maturing groups, including only cases of Old American and North European stock........ 78

LIST OF FIGURES

1. Curves of height: means for early-, average-, and late-maturing girls........ 54
2. Curves of stem length: means for early-, average-, and late-maturing girls........ 55
3. Curves of bi-iliac diameter: means for early-, average-, and late-maturing girls........ 55
4. Curves of biacromial diameter: means for early-, average-, and late-maturing girls........ 56
5. Curves of height: means for early-, average-, and

late-maturing girls, adjusted to equivalent skeletal ages ... 57
6. Curves of stem length: means for early-, average-, and late-maturing girls, adjusted to equivalent skeletal ages ... 57
7. Curves of bi-iliac diameter: means for early-, average-, and late-maturing girls, adjusted to equivalent skeletal ages ... 58
8. Curves of biacromial diameter: means for early-, average-, and late-maturing girls, adjusted to equivalent skeletal ages ... 58
9. Curves of the $\frac{\text{bi-iliac}}{\text{height}}$ index: means for early-, average-, and late-maturing girls, adjusted to equivalent skeletal ages ... 60
10. Curves of the $\frac{\text{stem length}}{\text{height}}$ index: means for early-, average-, and late-maturing girls, adjusted to equivalent skeletal ages ... 62
11. Curves of the $\frac{\text{bi-iliac}}{\text{biacromial}}$ index: means for early-, average-, and late-maturing girls, adjusted to equivalent skeletal ages ... 62
12. Curves of height: means for early-, average-, and late-maturing boys ... 65
13. Curves of stem length: means for early-, average-, and late-maturing boys ... 65
14. Curves of bi-iliac diameter: means for early-, average-, and late-maturing boys ... 66
15. Curves of biacromial diameter: means for early-, average-, and late-maturing boys ... 66
16. Curves of height: means for early-, average-, and late-maturing boys, adjusted to equivalent skeletal ages ... 67
17. Curves of stem length: means for early-, average-, and late-maturing boys, adjusted to equivalent skeletal ages ... 67
18. Curves of bi-iliac diameter: means for early-, average-, and late-maturing boys, adjusted to equivalent skeletal ages ... 68
19. Curves of biacromial diameter: means for early-, average-, and late-maturing boys, adjusted to equivalent skeletal ages ... 68
20. Curves of the $\frac{\text{bi-iliac}}{\text{height}}$ index: means for early-, average-, and late-maturing boys, adjusted to equivalent skeletal ages ... 69
21. Curves of the $\frac{\text{bi-iliac}}{\text{biacromial}}$ index: means for early-, average-, and late-maturing boys, adjusted to equivalent skeletal ages ... 71

22. Curves of the $\frac{\text{stem length}}{\text{height}}$ index: means for early-, average-, and late-maturing boys, adjusted to equivalent skeletal ages..... 72
23. Curves of the $\frac{\text{stem length}}{\text{height}}$ index: means for six groups, adjusted to equivalent skeletal maturity..... 73
24. Individual T-score curves of height for the seven earliest-maturing boys (a T-score of 50 represents the mean for all boys)..... 80
25. Individual T-score curves of height for the seven latest-maturing boys..... 80
26. Silhouettes of a typical late-maturing boy (left) and a typical early-maturing boy (right), photographed at 13 and at 17 years of age..... 81
27. Individual T-score curves of height for the seven latest-maturing girls (a T-score of 50 represents the mean for all girls)..... 84
28. Individual T-score curves of height for the seven earliest-maturing girls..... 84

SIZE AND BODY BUILD OF ADOLESCENTS IN RELATION TO RATE OF SKELETAL MATURING

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INTRODUCTION

In a companion article (3) a close relationship has been demonstrated between degree of skeletal maturity and growth in body dimensions when the latter are expressed as percentages of the individual's own mature measurements. In the present study, using the same experimental data, we shall alter the emphasis, and be concerned with the bearing of skeletal maturing, as contrasted with chronological age, on growth in absolute size. These comparisons are made in a number of anthropometric dimensions, and in developmental changes which occur in indices derived from some of these anthropometric dimensions. Skeletal age is here treated as an indicator of relative physical maturity, and complete closure of the epiphyses represents mature or adult physical status.

The data in Tables 5 and 6, in the earlier monograph (3) have indicated that there are some age changes and some sex differences in correlations between height and skeletal age. From these tables it appears, especially before 15 years, the more mature boys are taller, the less mature boys shorter, than the average. After 15 years the correlations drop rapidly, though they remain positive. Apparently the early-maturing boys tend to lose their advantage and the late-maturing boys their disadvantage as they approach maturity, but it is probable that some of the differences between early and late maturers persist and are related to differences in body build in adults. Richey, using axillary hair as a criterion of maturity, found that "Boys who mature late are not only shorter and lighter up to a late age but are lighter proportionately to their height at all ages than are those who mature early" (4, p. 61).

The correlations for the girls (3, Table 6) are quite different from those for the boys. This is in part due to the fact that they cover ages nearer to maturity. At the ages for which we have data the r's are practically zero, with a tendency to become negative with approaching maturity. From these r's we might say that at least from 13 1/2 to 14 1/2 years there is no relation between size and relative maturity, but that at the later ages the late-maturing girls are relatively tall, the early-maturing girls relatively short.

The differences which have been shown in this general way by the correlation coefficients can be analyzed further by breaking the sample down into smaller, relatively homogeneous groups and studying the growth trends of these groups. Such groups are the early-, average-, and late-maturing ones which have been already described (3). The girls were divided on the basis of age at reaching complete skeletal maturity, or Skeletal Age (Sk. A.) 16.2 on the Todd Standards (11, 12). The boys were of necessity divided according to age at reaching Sk. A. of 17.2, or one year short of skeletal maturity. These groups in each sex are approximately one year apart in Chronological Age (C. A.) at reaching the "mature" skeletal standard. They are divided: girls 25 early-, 27 average-, and 19 late-maturing; boys 21 early-, 35 average-, and 21 late-maturing. An advantage of this procedure of grouping the cases according to age at reaching maturity, is that trends of growth for such groups can be extended back to ages earlier than those for which we have skeletal age data, and longitudinal trends in other than skeletal data may be examined from the age of 10 years through 18 years.

These maturity-groups have been compared for four anthropometric dimensions, namely: height, stem length, bi-iliac diameter, and biacromial diameter. Comparisons of the growth trends of the means of these measures for the six groups of children reflect the correlational data and indicate further differences and similarities (Table 1).

TABLE 1

MEANS AND STANDARD DEVIATIONS (S.D.) OF FOUR ANTHROPOMETRIC DIMENSIONS FOR GROUPS DIVIDED ON THE BASIS OF AGE AT REACHING SKELETAL MATURITY

GIRLS

Height
(Millimeters)

	Early-Maturing			Average-Maturing			Late-Maturing		
C.A.	n	Mean	S.D.	n	Mean	S.D.	n	Mean	S. D.
10.7	12	1446	50	12	1406	61	8	1434	79
11.2	17	1496	53	23	1442	52	11	1401	68
11.7	23	1519	59	24	1474	55	18	1437	82
12.2	22	1549	61	25	1504	54	18	1481	82
12.7	25	1568	59	26	1542	48	17	1514	80
13.2	22	1584	59	25	1572	49	18	1562	69
13.7	24	1592	55	28	1589	48	20	1576	76
14.2	25	1604	56	27	1600	49	19	1502	64
14.7	25	1611	54	26	1608	54	19	1600	62
15.2	23	1615	56	25	1616	49	18	1619	62
15.7	24	1614	56	22	1623	55	18	1636	57
16.2	23	1622	52	27	1618	52	18	1637	64
16.7	22	1620	51	25	1625	54	18	1639	66
17.2	22	1620	54	22	1635	51	19	1647	69
17.7	18	1618	57	15	1625	54	15	1649	61

TABLE 1 (Cont.)

Stem Length

	Early-Maturing			Average-Maturing			Late-Maturing		
C.A.	N	Mean	S.D.	n	Mean	S.D.	n	Mean	S.D.
10.7	12	743	25	12	728	26	8	739	25
11.2	17	775	32	23	745	23	11	730	36
11.7	23	788	38	24	758	30	18	743	39
12.2	22	802	38	25	769	31	18	763	42
12.7	25	816	34	26	792	28	17	779	40
13.2	22	828	33	25	810	24	18	800	37
13.7	24	839	32	27	823	23	20	812	42
14.2	25	846	32	27	834	21	19	821	40
14.7	24	852	32	28	840	21	19	836	33
15.2	21	857	36	23	846	21	18	846	34
15.7	24	860	33	22	851	24	18	854	32
16.2	23	863	33	27	853	22	17	860	34
16.7	22	865	32	25	855	23	18	866	33
17.2	21	865	35	22	863	20	19	869	33
17.7	18	865	34	15	862	22	15	870	28
Bi-iliac Diameter									
10.7	12	241	16	12	228	10	8	229	9
11.2	17	246	14	23	235	14	11	232	14
11.7	23	248	14	24	242	14	18	234	13
12.2	22	257	15	25	245	15	18	240	14
12.7	25	261	14	26	253	14	17	245	12
13.2	22	262	13	25	260	13	18	253	13
13.7	24	266	12	27	264	14	20	257	14
14.2	25	272	13	27	268	14	19	262	14
14.7	25	276	15	26	271	14	19	266	14
15.2	22	278	16	24	273	16	18	270	16
15.7	24	278	14	22	279	9	18	274	15
16.2	23	280	16	27	280	14	17	280	15
16.7	22	280	14	25	282	13	19	279	16
17.2	22	281	15	22	283	14	19	283	15
17.7	18	283	17	15	280	14	15	284	13
Biacromial Diameter									
10.7	12	314	13	12	305	17	8	323	10
11.2	17	319	18	23	309	14	11	314	18
11.7	23	326	16	24	316	14	18	314	19
12.2	22	331	18	25	323	16	18	321	18
12.7	25	335	17	26	331	14	17	328	19
13.2	22	342	18	25	338	13	18	343	19
13.7	24	344	17	27	342	15	20	340	22
14.2	25	350	18	27	345	12	19	345	19
14.7	24	349	17	26	346	13	19	350	17
15.2	21	347	22	24	352	14	18	352	17
15.7	24	351	18	22	354	11	18	358	17
16.2	23	351	16	27	353	13	17	362	19
16.7	22	353	16	25	356	12	18	360	20
17.2	21	353	15	22	359	10	19	366	19
17.7	18	353	17	15	358	12	15	369	20

GROWTH RATES AND BODY BUILD OF EARLY-, AVERAGE-, AND LATE-MATURING GROUPS

a. Girls

The mean values of height for girls, when plotted against age, show (Figure 1) that the late-maturing girls as a group are short in the early ages, but become the tallest group after 15.5 years, while the reverse is true of the early-maturing girls, the average group taking the mean course throughout. This accounts for the directional trend of the correlations we have and would lead us to expect even higher positive _r_'s at earlier ages, back at least to 9 or 10 years, when the adolescent growth spurts start. In stem length (Figure 2) and bi-iliac diameter (Figure 3) the same differences occur, with the exception that the groups reverse their positions at a somewhat later age. The biacromial curves (Figure 4) give a similar, though less clear-cut, picture. These findings are in general in accord with those in other studies on other groups of children (7, 10). Furthermore, they are to be expected in view of the close relation between a child's growth in size and his skeletal age, as shown in the high correlations between these factors (3, Tables 5 and 6). As the early-maturing girls approach maturity their growth slows down and stops at an age when the late-maturing girls are still growing fairly rapidly.

Figure 1

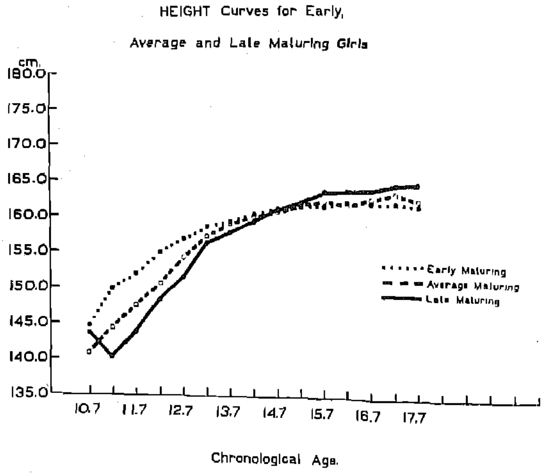


Figure 2

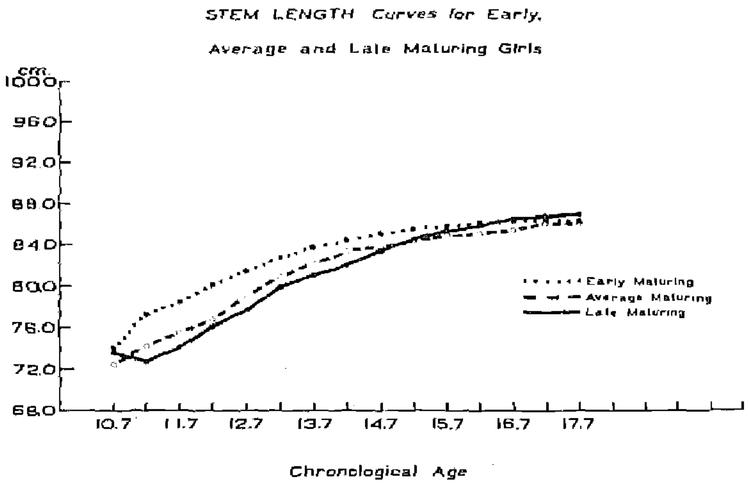

STEM LENGTH Curves for Early, Average and Late Maturing Girls

Figure 3

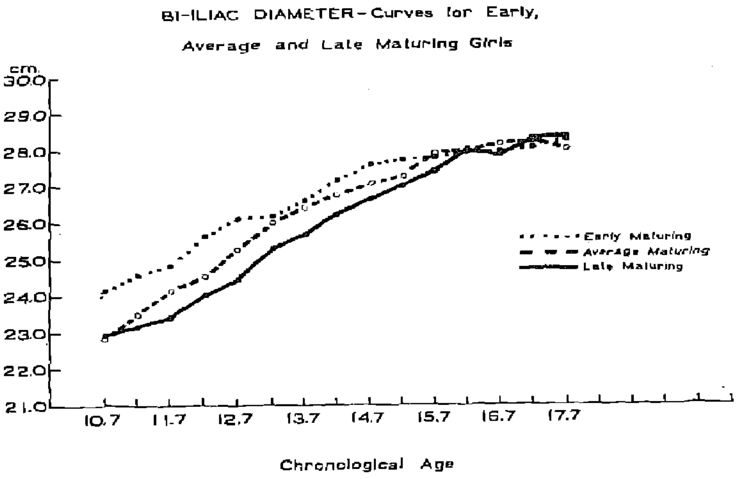
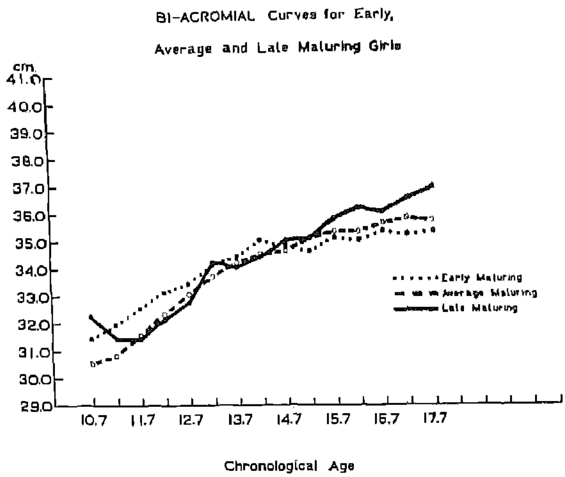

BI-ILIAC DIAMETER – Curves for Early, Average and Late Maturing Girls

Figure 4



In Figures 1 - 4 we have compared children of the same chronological ages. The differences are clarified considerably when comparisons are made on the basis of similar skeletal maturity. This has been done, in a rough way, by adjusting the C. A. base line so that for any given point on the vertical axis the early-maturing group is one year younger and the late-maturing group is one year older than the average group.[1] This difference holds quite well at all ages, as we see in Table 2. These adjusted curves (Figures 5, 6, 7, and 8) show the late-maturing girls to be consistently large for their skeletal maturity, and the early-maturing girls to be consistently small, in all of the dimensions studied, i. e., height, stem-length, bi-iliac diameter and biacromial diameter. The differences, however, are large enough to be statistically significant

---

[1] *A more satisfactory method would be to plot the curves of growth against actual skeletal age. However, our skeletal data are available over so short an interval and the number of cases at any skeletal age would be so small that such an operation on our data does not seem feasible. Furthermore, the method here used is comparable to those used in other studies, in which some single point (e.g., menarche) was used to "equalize" physical maturity.*

Figure 5

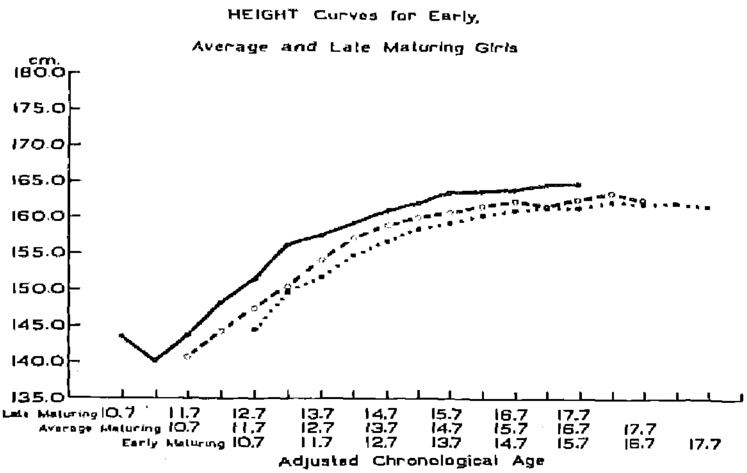


Figure 6

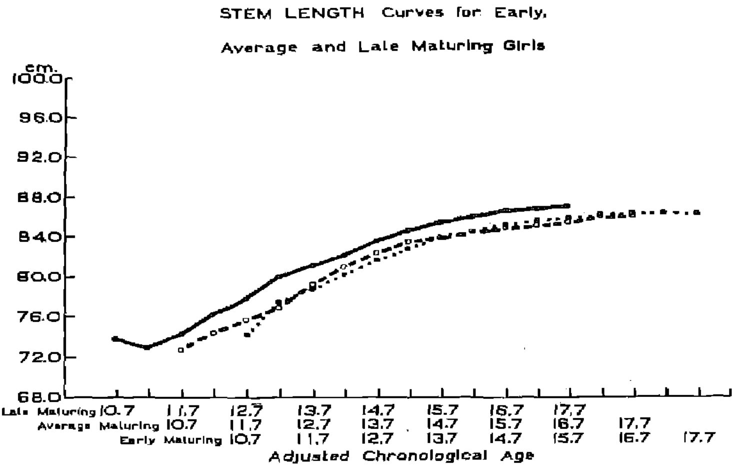


Figure 7

BI-ILIAC DIAMETER - Curves for Early, Average and Late Maturing Girls

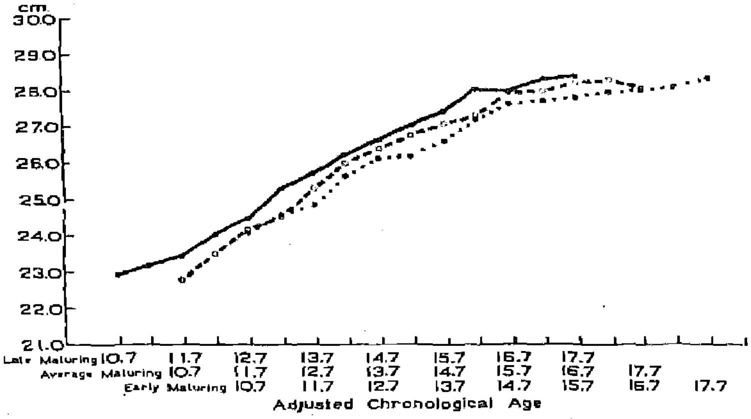


Figure 8

BI-ACROMIAL WIDTH Curves for Early, Average and Late Maturing Girls

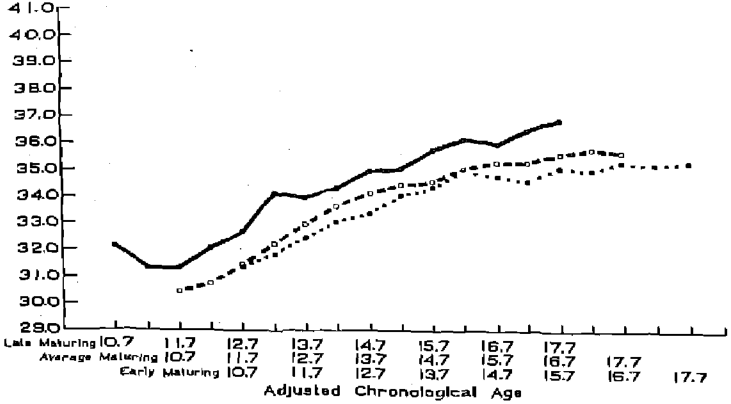


TABLE 2

MEANS AND STANDARD DEVIATIONS (S.D.) OF SKELETAL AGE SCORES AT GIVEN CHRONOLOGICAL AGES OF GROUPS DIVIDED ACCORDING TO AGE AT REACHING MATURE SKELETAL STATUS*

	Early-Maturing			Average-Maturing			Late-Maturing		
C.A.	n	Mean	S.D.	n	Mean	S.D.	n	Mean	S.D.
BOYS									
13.7	7	14.9	.37	16	13.7	.52	6	13.1	.45
14.2	14	15.4	.55	28	14.1	.52	17	13.5	.52
14.7	18	15.9	.56	31	14.6	.57	17	13.8	.46
15.2	19	16.5	.59	34	15.3	.55	20	14.4	.56
15.7	14	16.8	.51	33	15.8	.49	21	15.0	.43
16.2	17	17.2	.51	33	16.3	.40	17	15.5	.39
16.7	15	17.8	.40	32	16.8	.43	20	15.9	.44
17.2	17	18.0	.24	31	17.4	.45	19	16.4	.33
GIRLS									
13.7	12	15.0	.77	14	13.7	.38	8	13.2	.46
14.2	19	15.6	.54	23	14.5	.51	14	13.5	.66
14.7	23	16.0	.40	26	15.1	.50	19	14.0	.65
15.2	25	16.2	.23†	26	15.4	.45	16	14.6	.53
15.7	25	16.2	-	22	15.8	.37	18	15.0	.50

*This table is the same as Table 10 in the companion monograph (3).
†Three previously mature cases placed at 16.5 Sk. A.

in only three instances, though the trends are consistent.[2] The greatest differences occur in biacromial width between early- and late-maturing girls, with the critical ratios ranging from 1.8 to 3.7, and averaging 2.5 (Table 3). From these data we may say that the girl who matures rapidly is a little more likely to be small relative to her skeletal age, and that she is more likely to be a short adult. On the other hand, the girl who matures slowly is often large for her skeletal age, and relatively broad-shouldered, and so may not seem, in pre-adolescence, very small for her chronological age. Furthermore she is more likely to become a large adult.

So much for the absolute dimensions. How do these girls compare in body build? (Table 4). It has been said (6) that broad-built girls mature early, but is this only apparently true because of their relatively mature status at 12 to 14 years when the comparisons were made? Perhaps we should say, instead, that early-maturing girls achieve their adult, broad-hipped build at an earlier age than do the late-maturing girls. The mean curves of the $\frac{\text{bi-iliac}}{\text{height}}$ indices for the three groups of girls

---

[2] Such consistent trends in longitudinal studies may be due to sampling errors which persist because the sample remains constant. The conclusive test will be in similar treatment of other samples.

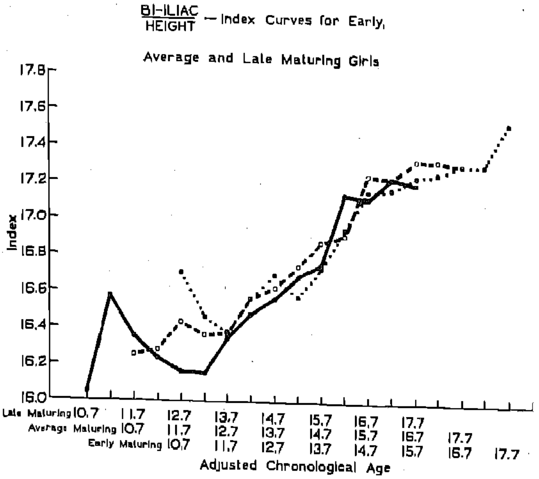
TABLE 3

CRITICAL RATIOS BETWEEN MEANS OF EARLY- AND LATE-MATURING GIRLS FOR FOUR ANTHROPOMETRIC MEASURES, WHEN ADJUSTED TO EQUIVALENT SKELETAL MATURITY

C.A.		Critical Ratios			
Early Maturers	Late Maturers	Height	Stem Length	Bi-iliac	Biacromial
10.7	12.7	2.8	3.0	0.7	2.2
11.2	13.2	3.2	2.2	1.5	3.7
11.7	13.7	2.8	2.0	2.0	2.5
12.2	14.2	2.2	1.8	1.2	2.4
12.7	14.7	2.2	1.9	1.1	3.0
13.2	15.2	1.6	1.6	1.8	1.8
13.7	15.7	2.5	1.5	1.9	2.6
14.2	16.2	1.7	1.4	1.8	2.0
14.7	16.7	1.5	1.4	0.6	1.9
15.2	17.2	1.6	1.1	1.2	3.0
15.7	17.7	1.8	1.1	1.3	2.8

are shown, in Figure 9, adjusted to equate the groups for skeletal maturity. The three curves overlap each other throughout the age-ranges covered in this study. Differences in hip-width relative to height are not related to rate of maturing in girls when they are equated for skeletal age. The same is true of the relative proportions of stem and legs, as shown in the

Figure 9



$\frac{\text{BI-ILIAC}}{\text{HEIGHT}}$ — Index Curves for Early, Average and Late Maturing Girls

TABLE 4

MEANS AND STANDARD DEVIATIONS (S.D.) OF THREE ANTHROPOMETRIC INDICES FOR GROUPS DIVIDED ON THE BASIS OF AGE AT REACHING SKELETAL MATURITY

GIRLS

	Early-Maturing			Average-Maturing			Late-Maturing		
C.A.	n	Mean	S.D.	n	Mean	S.D.	n	Mean	S.D.
				Stem Length/Height					
10.7	12	51.4	1.1	12	51.8	1.2	8	51.6	1.4
11.2	17	51.9	1.7	23	51.6	1.1	11	52.2	0.9
11.7	23	51.9	1.6	24	51.5	1.3	18	51.7	1.1
12.2	22	51.8	1.5	25	51.2	1.2	18	51.5	1.0
12.7	25	52.1	1.4	26	51.4	1.4	17	51.4	1.0
13.2	22	52.3	1.5	25	51.5	1.2	18	51.3	1.1
13.7	24	52.6	1.5	27	51.8	1.4	20	51.6	1.1
14.2	25	52.7	1.6	27	52.2	1.3	19	51.6	1.3
14.7	24	52.9	1.6	26	52.3	1.3	19	52.0	1.3
15.2	21	53.1	1.7	23	52.5	1.3	18	52.3	1.1
15.7	24	53.3	1.5	22	52.5	1.3	18	52.3	1.3
16.2	23	53.2	1.5	27	52.7	1.2	17	52.6	1.1
16.7	22	53.4	1.4	25	52.6	1.3	18	52.9	1.0
17.2	21	53.3	1.5	22	52.8	1.1	19	52.8	1.0
17.7	18	53.4	1.3	15	53.1	0.8	15	52.8	1.1
				Bi-iliac/Height					
10.7	12	16.7	.94	12	16.2	.63	8	16.0	.55
11.2	17	16.5	.84	23	16.3	.74	11	16.6	.56
11.7	23	16.4	.73	24	16.4	.75	18	16.4	.59
12.2	22	16.6	.72	25	16.4	.80	18	16.2	.55
12.7	25	16.7	.78	26	16.4	.80	17	16.2	.53
13.2	22	16.6	.76	25	16.6	.86	18	16.2	.55
13.7	24	16.7	.75	27	16.6	.88	20	16.3	.60
14.2	25	16.9	.78	27	16.7	.87	19	16.5	.61
14.7	25	17.2	.81	26	16.9	.86	19	16.6	.62
15.2	22	17.2	.86	24	16.9	.94	18	16.7	.69
15.7	24	17.2	.80	22	17.2	.71	18	16.8	.64
16.2	23	17.2	.85	27	17.2	.84	17	17.1	.70
16.7	22	17.3	.79	25	17.3	.80	18	17.1	.65
17.2	22	17.3	.90	22	17.3	.88	19	17.2	.68
17.7	18	17.5	.81	15	17.3	.82	15	17.2	.57
				Bi-iliac/Biacromial					
10.7	12	77.2	4.0	12	75.0	3.3	8	71.8	1.4
11.2	17	77.4	4.6	23	75.9	5.0	11	74.7	2.4
11.7	23	76.7	4.4	24	76.5	3.8	18	74.8	3.4
12.2	22	77.5	3.8	25	75.8	3.8	18	74.7	2.8
12.7	25	78.4	4.4	26	76.3	3.8	17	74.7	3.7
13.2	22	77.2	3.8	25	76.9	4.1	18	74.1	3.2
13.7	24	77.6	4.0	27	77.5	4.4	20	75.8	3.7
14.2	25	77.8	4.1	27	77.8	4.6	19	75.9	3.3
14.7	24	79.2	4.3	26	78.3	4.5	19	76.0	3.5
15.2	21	79.9	5.4	24	77.5	3.8	18	76.8	3.8
15.7	24	79.4	4.8	22	79.1	3.4	18	76.6	3.1
16.2	23	79.8	4.2	27	79.2	3.6	17	77.4	3.0
16.7	22	79.4	3.9	25	79.1	3.6	18	77.6	3.5
17.2	22	80.0	4.3	22	78.9	3.6	19	77.4	3.9
17.7	18	80.2	4.9	15	78.4	3.4	15	76.9	3.7

$\frac{\text{stem length}}{\text{height}}$ index curves in Figure 10. There does appear, however, to be a tendency for the late-maturing girls to be relatively broad-shouldered (Figure 11).

Figure 10

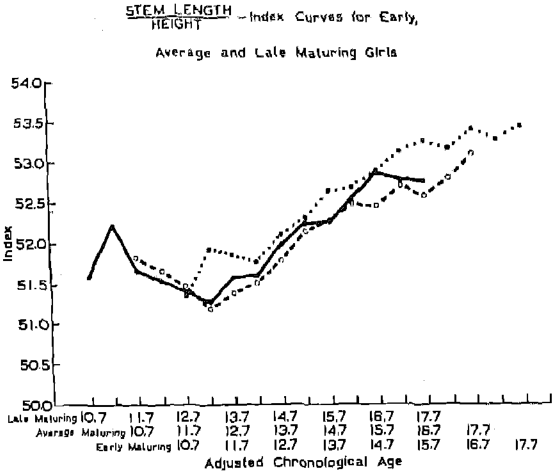
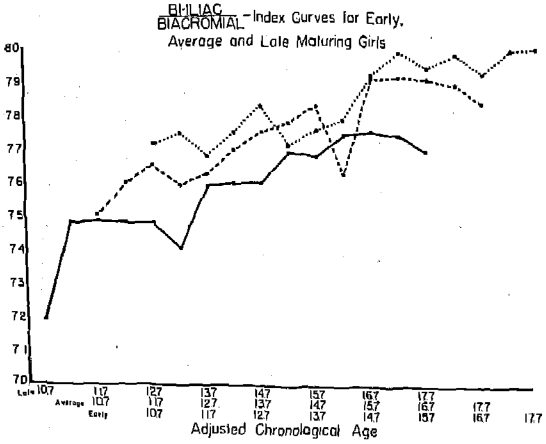


Figure 11



So far as the girls are concerned, the only differences w have discovered in relation to rate of skeletal maturing are i general size, and in a tendency for the late-maturing girls to b broad-shouldered. In these respects the late-maturing girls ar built somewhat more like the boys, though the sex difference in both size and growth trends remain large. As a concomitan of their rates of maturing, girls achieve their adult build a different chronological ages, and so temporarily, at around 1 years of age, the early-maturing girls are "broad-built" i comparison with the late-maturing girls of the same age.

b. Boys

The same anthropometric comparisons have been made fo the boys with somewhat different results (Table 5). When th

TABLE 5

MEANS AND STANDARD DEVIATIONS (S.D.) OF FOUR ANTHROPOMETRIC DIMENSIONS FOR GROUPS DIVIDED ON THE BASIS OF AGE AT REACHING SKELETAL MATURITY

BOYS

Height
(Millimeters)

	Early-Maturing			Average-Maturing			Late-Maturing		
C.A.	n	Mean	S.D.	n	Mean	S.D.	n	Mean	S.D.
10.7	7	1490	53	19	1419	54	12	1421	36
11.2	13	1493	66	24	1436	60	12	1438	48
11.7	19	1512	70	30	1464	60	18	1450	49
12.2	16	1568	71	33	1488	58	18	1471	50
12.7	20	1590	83	35	1517	63	20	1495	50
13.2	19	1644	84	34	1554	70	20	1521	52
13,7	21	1687	83	33	1599	70	21	1552	55
14.2	19	1734	78	32	1636	72	20	1586	60
14.7	20	1736	74	34	1677	69	21	1624	65
15.2	17	1755	86	34	1706	63	19	1668	66
15.7	17	1778	77	33	1732	67	21	1710	60
16.2	15	1800	70	31	1748	62	18	1744	59
16.7	16	1795	58	34	1755	64	20	1757	58
17.2	15	1819	69	29	1760	68	20	1768	55
17,7	14	1821	54	23	1760	57	19	1782	54
				Stem Length					
10.7	7	774	23	19	737	28	12	734	19
11,2	13	770	24	24	744	28	12	735	24
11,7	19	781	31	30	755	31	18	741	24
12.2	16	802	28	33	765	28	18	748	26
12,7	20	814	36	35	776	31	20	756	27
13,2	19	840	38	34	794	33	20	767	27
13.7	21	866	37	33	815	36	21	780	27
14,2	19	889	36	32	837	37	20	795	31
14.7	20	901	34	34	860	36	21	816	36
15,2	17	913	38	34	878	33	19	841	39
15,7	17	927	31	33	896	32	21	863	36
16.2	15	240	29	31	907	29	18	887	34
16.7	16	943	23	34	914	32	20	895	33
17,2	15	950	26	29	919	35	20	905	28
17.7	14	954	25	23	916	32	19	916	25

TABLE 5 (Cont.)

Bi-iliac Diameter

C.A.	Early-Maturing n	Early-Maturing Mean	Early-Maturing S.D.	Average-Maturing n	Average-Maturing Mean	Average-Maturing S.D.	Late-Maturing n	Late-Maturing Mean	Late-Maturing S.D.
10.7	7	240	13	19	225	14	12	218	11
11.2	13	237	14	24	224	14	12	226	9
11.7	19	242	13	30	230	12	18	224	10
12.2	16	252	15	33	234	13	18	229	10
12.7	20	257	15	35	238	14	20	233	13
13.2	19	264	15	34	244	15	20	237	12
13.7	21	271	14	33	250	14	21	240	11
14.2	19	278	14	32	257	14	20	246	12
14.7	20	279	10	34	263	14	21	250	12
15.2	17	283	16	34	268	14	19	259	13
15.7	17	288	15	33	273	14	21	264	11
16.2	15	290	13	31	275	13	18	272	12
16.7	16	288	10	34	276	15	20	274	11
17.2	15	291	14	29	276	14	20	275	10
17.7	14	293	13	23	278	14	19	277	10

Biacromial Diameter

C.A.	Early-Maturing n	Early-Maturing Mean	Early-Maturing S.D.	Average-Maturing n	Average-Maturing Mean	Average-Maturing S.D.	Late-Maturing n	Late-Maturing Mean	Late-Maturing S.D.
10.7	7	311	14	19	299	17	12	296	17
11.2	13	312	16	24	303	12	12	304	16
11.7	19	318	15	30	307	12	18	304	18
12.2	16	336	18	33	313	12	16	310	14
12.7	20	338	19	35	319	15	20	314	17
13.2	19	347	20	34	326	16	20	317	17
13.7	21	361	21	33	337	16	21	321	20
14.2	19	371	20	32	346	17	20	331	22
14.7	20	378	16	34	357	17	21	337	23
15.2	18	382	21	34	364	15	19	349	23
15.7	16	392	21	33	375	15	21	360	22
16.2	15	398	22	31	381	13	18	372	23
16.7	16	398	15	34	383	15	20	376	23
17.2	15	404	23	29	386	17	20	380	22
17.7	14	407	21	23	389	16	19	388	19

three maturity groups are compared on the basis of chronological age, the early-maturing boys are consistently larger than the others at all ages, while the late-maturing boys tend to be smaller than the average between 12 and 16 years. (Figures 12, 13, 14, and 15). This is true of all four measures. The late-maturing boys appear to have fallen behind the average group in the pre-pubescent period, and only catch up as they approach maturity. There is, in fact, some indication from the upward direction of the curve at the latest measures, that in height the late-maturing group will eventually outstrip the average group and be as tall as, or taller than, the early-maturing group when they finally attain their complete growth.

When these curves are adjusted for skeletal maturity (Figures 16, 17, 18, and 19), there are no differences except a tendency for the early-maturing boys to be wider-hipped (bi-iliac diameter). With approaching maturity this latter difference becomes statistically significant, with a critical ratio of 3.2. That is, for their skeletal ages, both the early and late-maturing boys are similar in size to those who mature at an

Figure 12

HEIGHT Curves for Early, Average and Late Maturing Boys

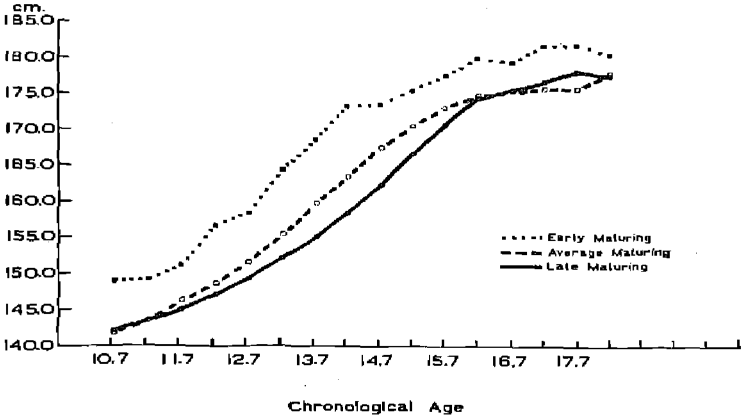


Figure 13

STEM LENGTH Curves for Early, Average and Late Maturing Boys

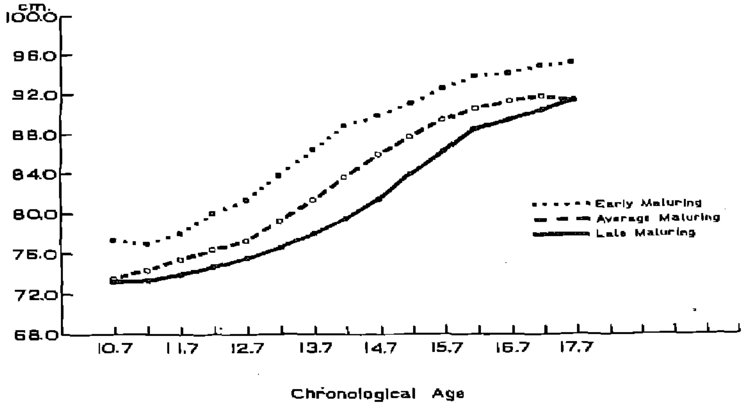


Figure 14

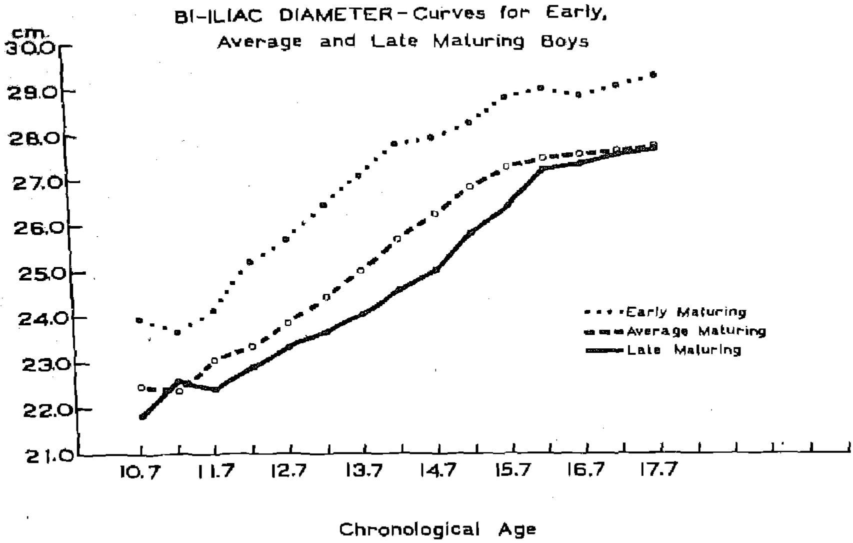


Figure 15

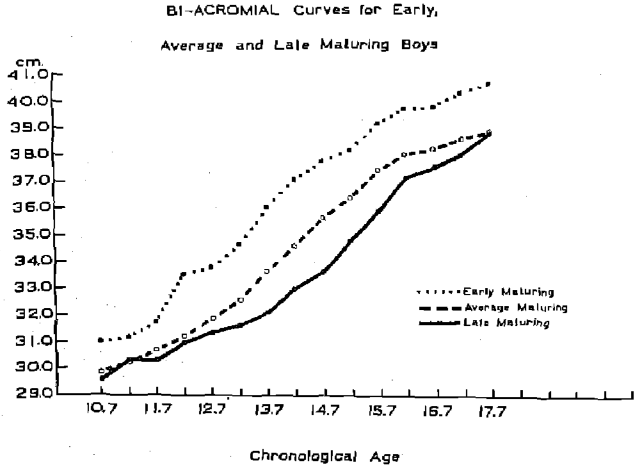


Figure 16

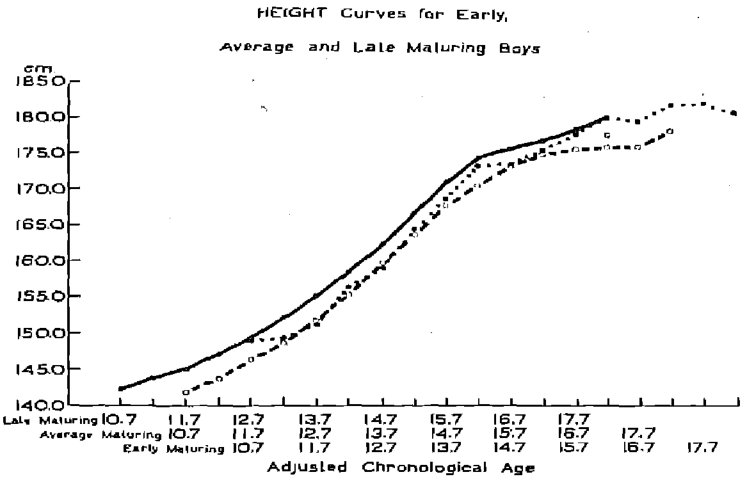

HEIGHT Curves for Early, Average and Late Maturing Boys

Figure 17

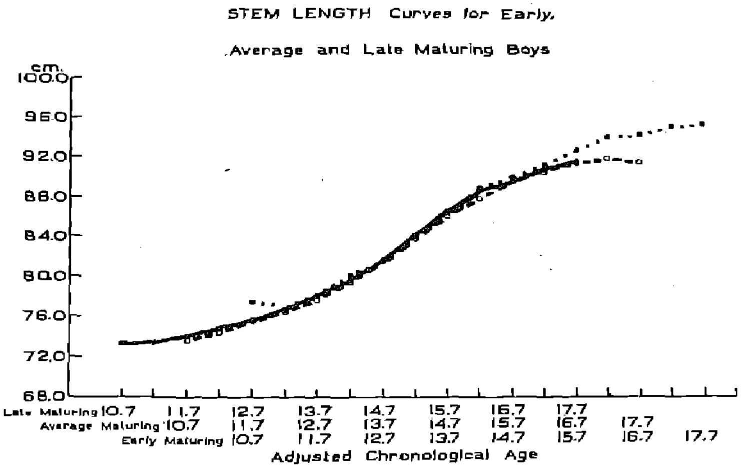

STEM LENGTH Curves for Early, Average and Late Maturing Boys

Figure 18

BI-ILIAC DIAMETER-Curves for Early, Average and Late Maturing Boys

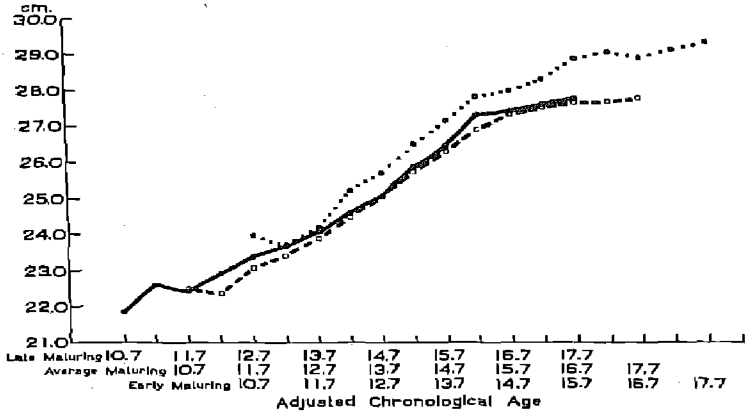


Figure 19

BI-ACROMIAL WIDTH Curves for Early, Average and Late Maturing Boys

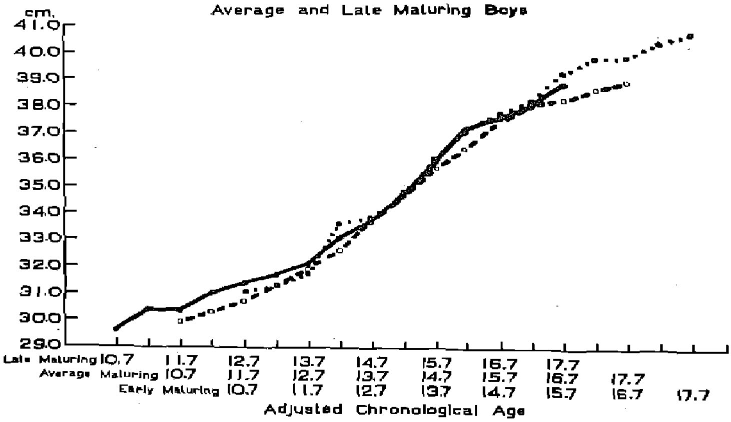
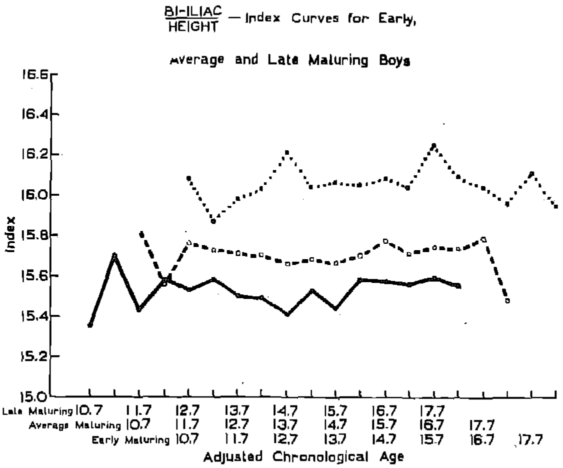


TABLE 6

MEANS AND STANDARD DEVIATIONS (S.D.) OF BOYS $\frac{\text{BI-ILIAC}}{\text{HEIGHT}}$ INDEX GROUPED ACCORDING TO AGE AT REACHING SKELETAL MATURITY

C.A.	Early-Maturing n	Early-Maturing Mean	Early-Maturing S.D.	Average-Maturing n	Average-Maturing Mean	Average-Maturing S.D.	Late-Maturing n	Late-Maturing Mean	Late-Maturing S.D.
10.7	7	16.1	.93	19	15.8	.88	12	15.4	.63
11.2	13	15.9	.42	24	15.6	.85	12	15.7	.44
11.7	19	16.0	.66	30	15.8	.71	18	15.4	.47
12.2	16	16.0	.56	33	15.7	.72	18	15.6	.48
12.7	20	16.2	.54	35	15.7	.74	20	15.5	.54
13.2	19	16.0	.60	34	15.7	.78	20	15.6	.45
13.7	21	16.1	.58	33	15.7	.69	21	15.5	.47
14.2	19	16.0	.60	32	15.7	.72	20	15.5	.43
14.7	20	16.1	.60	34	15.7	.71	21	15.4	.50
15.2	18	16.0	.67	34	15.7	.73	19	15.5	.49
15.7	16	16.2	.57	33	15.8	.70	21	15.4	.42
16.2	15	16.1	.54	31	15.7	.70	18	15.6	.54
16.7	16	16.0	.63	34	15.7	.72	20	15.6	.46
17.2	15	16.0	.58	29	15.7	.70	20	15.6	.50
17.7	14	16.1	.58	23	15.6	.66	19	15.6	.57

Figure 20



average rate. The one exception to this is the bi-iliac diameter. The early maturers remain characteristically broader-hipped than the others. Critical ratios are given in Table 7 between the average and early maturers when adjusted to equivalent skeletal ages. These critical ratios are higher at the later ages, being greater than two at five comparisons.

TABLE 7

CRITICAL RATIOS BETWEEN MEANS OF EARLY, AVERAGE, AND LATE-MATURING GROUPS OF BOYS WHEN ADJUSTED TO EQUIVALENT SKELETAL AGES

C.A.			Critical Ratios						
			Height	Bi-iliac	$\frac{\text{Stem Length}}{\text{Height}}$		$\frac{\text{Bi-iliac}}{\text{Height}}$		
Early	Average	Late	Av. vs. Late	Av. vs. Early	Early vs. Late	Av. vs. Late	Early vs. Av.	Early vs. Late	Av. vs. Late
	10.7	11.7	1.9			2.8			1.7
	11.2	12.2	2.0			3.5			0.1
10.7	11.7	12.7	2.0	1.7	4.3	3.7	0.9	1.5	1.3
11.2	12.2	13.2	2.2	0.7	3.4	3.5	0.8	1.9	0.9
11.7	12.7	13.7	2.2	0.9	4.6	3.3	1.4	2.6	1.3
12.2	13.2	14.2	1.7	1.7	2.8	3.0	1.7	3.2	1.3
12.7	13.7	14.7	1.4	1.6	4.0	2.7	3.2	4.9	1.5
13.2	14.2	15.2	1.6	1.7	2.0	2.2	1.9	2.8	0.9
13.7	14.7	15.7	1.9	2.1	2.4	2.8	2.3	4.0	1.4
14.2	15.2	16.2	2.2	2.5	1.8	2.3	1.9	2.5	0.7
14.7	15.7	16.7	1.5	1.9	3.1	2.6	1.7	3.0	1.2
15.2	16.2	17.2	1.2	1.9	3.0	2.6	1.6	2.5	0.9
15.7	16.7	17.7	1.6	2.8	2.8	3.0	2.7	3.4	0.8
16.2	17.2			3.2			1.9		
16.7	17.7			2.7			1.2		

As for indices of body build, the curves for the $\frac{\text{bi-iliac}}{\text{height}}$ index (adjusted for skeletal maturity - Figure 20 and Table 6) show the three groups of boys to be unlike each other. The differences found here between the early- and late-maturing groups are at most ages significant, with critical ratios for ages later than 11.5 years ranging between 2.5 and 4.9 (Table 7). In other words, the early-maturing boys are typically broad-built (as indicated by hip-width) while the late-maturing boys are generally slender-built in relation to their height, and all three maturity groups maintain their same relative status throughout the period of observation. It may be noticed in passing that the trends of these curves are very different from those of the girls for the same index. The girls become broad-hipped during adolescence, while the boys remain narrow-hipped in relation to their height.

The ratios between bi-iliac and biacromial diameters (Table 8 and Figure 21) again show the early-maturing boys with a comparatively large hip-shoulder ratio while the average- and late-maturing boys are alike in having broad shoulders relative to bi-iliac widths-- the relationship which is usually considered to be typically masculine. Sex differences in this index become marked for all groups after about 14 years of age, and in terms of directional growth trends the early-maturing boys are no more like the girls than are the other boys.

TABLE 8

MEANS AND STANDARD DEVIATIONS (S.D.) OF $\frac{\text{BI-ILIAC}}{\text{BIACROMIAL}}$ INDEX FOR GROUPS DIVIDED ON THE BASIS OF AGE AT REACHING SKELETAL MATURITY

BOYS

	Early-Maturing			Average-Maturing			Late-Maturing		
C.A.	n	Mean	S.D.	n	Mean	S.D.	n	Mean	S.D.
10.7	7	76.9	2.0	19	75.7	4.4	12	74.0	4.3
11.2	13	76.1	2.5	24	73.8	4.4	12	74.7	2.2
11.7	19	76.1	2.8	30	75.1	3.1	18	74.0	3.2
12.2	16	74.7	2.6	33	74.9	3.4	18	74.0	2.6
12.7	20	76.1	2.5	35	74.8	3.7	20	74.2	3.3
13.2	19	76.0	3.0	34	74.8	3.1	20	74.8	2.9
13.7	21	75.3	2.9	33	74.3	2.8	21	74.8	3.4
14.2	19	75.0	2.8	32	74.3	3.6	20	74.6	3.8
14.7	20	74.0	2.3	34	73.8	3.4	21	74.6	4.4
15.2	17	74.0	2.0	34	73.5	3.3	19	74.5	4.2
15.7	17	73.4	2.5	33	72.8	3.2	21	73.7	3.8
16.2	15	72.7	2.3	31	72.2	3.0	18	73.4	4.5
16.7	16	72.3	2.8	34	72.2	3.2	20	73.0	4.1
17.2	15	71.9	2.7	29	71.6	2.9	20	72.7	4.1
17.7	14	71.8	2.5	23	71.3	2.9	19	71.5	3.2

Figure 21

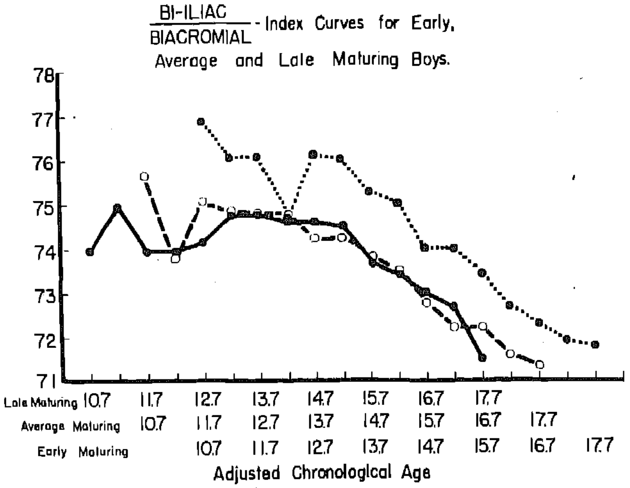


TABLE 9

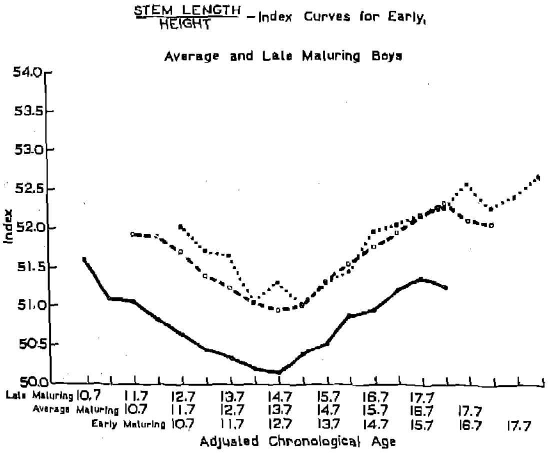
MEANS AND STANDARD DEVIATIONS (S.D.) OF $\frac{\text{STEM LENGTH}}{\text{HEIGHT}}$ INDEX FOR GROUPS DIVIDED ON THE BASIS OF AGE AT REACHING SKELETAL MATURITY

BOYS

	Early-Maturing			Average-Maturing			Late-Maturing		
C.A.	n	Mean	S.D.	n	Mean	S.D.	n	Mean	S.D.
10.7	7	52.0	0.6	19	51.9	1.0	12	51.6	0.9
11.2	13	51.7	1.1	24	51.9	1.0	12	51.1	1.1
11.7	19	51.6	0.8	30	51.7	1.0	18	51.1	0.9
12.2	16	51.1	0.9	33	51.4	1.1	18	50.8	0.9
12.7	20	51.3	0.9	35	51.2	1.1	20	50.6	1.0
13.2	19	51.0	1.1	34	51.0	1.1	20	50.4	0.9
13.7	21	51.3	1.1	33	50.9	1.2	21	50.3	0.9
14.2	19	51.4	1.1	32	51.0	1.1	20	50.2	0.9
14.7	20	51.9	1.0	34	51.3	1.2	21	50.2	0.9
15.2	17	52.0	0.8	34	51.5	1.2	19	50.4	0.9
15.7	17	52.2	1.0	33	51.7	1.2	21	50.5	0.9
16.2	15	52.2	1.0	31	51.9	1.1	18	50.9	0.9
16.7	16	52.6	1.0	34	52.2	1.2	20	51.0	1.0
17.2	15	52.2	1.0	29	52.3	1.2	20	51.2	0.9
17.7	14	52.4	0.7	23	52.1	0.9	19	51.4	0.8

The $\frac{\text{stem length}}{\text{height}}$ indices of the boys (Table 9, Figure 22) bring out another significant difference in build. The late-

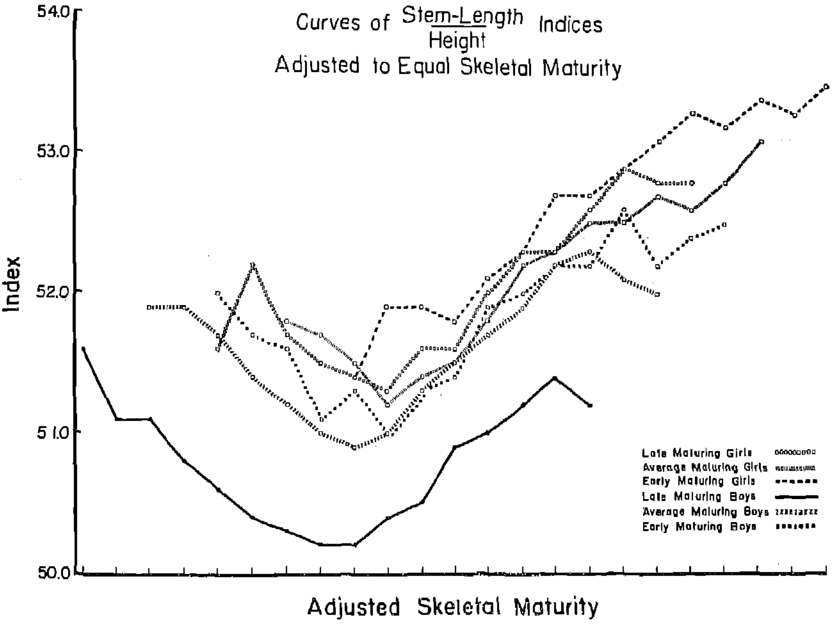
Figure 22



maturing boys are relatively long-legged - critical ratios range between 1.8 and 4.6 when the means are adjusted to equivalent skeletal age - while the early- and average-maturing boys are very like each other in this respect. Furthermore, if these curves are superimposed on the girls' curves, making adjustment to take care of the two-year difference in skeletal maturity (Figure 23), five of the six curves are seen to be practically identical, while the late-maturing boys stand out in a class by themselves. As we have seen earlier that they do not differ from the other boys in average stem length, this great difference appears to be primarily in the length of their legs. It would seem from this sample that the widespread belief that boys are relatively long-legged as compared with girls is due in large part to the influence of a small group of late-maturing boys.

It appears, then, that the late-maturing boy in this study is typically narrow-hipped and long-legged, and though small during his early teens, he tends to become tall or average in height as an adult, with average shoulder width. The early-maturing boy on the other hand is characteristically large and relatively broad-hipped at all ages.

Figure 23



INDIVIDUAL CASES

One of the principal advantages of a "longitudinal" study, such as the one in which the data for these findings were secured, is that we can trace the course of growth in an individual child as he develops. It is in order, then, to consider more specifically individual cases as they appear against the background of the group data. Numerous questions arise regarding the relations of the individuals to the total group and to the various sub-groups. Some of these questions are relevant to the material we have been working with. To what extent do the children in the group conform to the statistically differentiated "types" above described? When we examine the late-maturing boys, for example, how many of them can be described as average or tall in height, slender-built, long-legged? Furthermore, to what extent are our data influenced by the racial deviates who have been included? Do the South Europeans, who are reputed to mature early, show any similarity among themselves in rates of maturing and in body builds - and if so, to what extent does the inclusion of these cases influence the findings we have just presented?

First it may be well to consider, in the light of individual trends, the classification of early-, average-, and late-maturing cases which we have used. To what extent do these children remain in the same categories over the 3 1/2 year period for which we have x-ray data? We have already seen (Table 2) that the means of the groups remain well differentiated at earlier ages. Furthermore the r's for consistency of skeletal maturity ratings (3, Figure 1) remain fairly high even over the longest age interval (r is .80 between the ages of 14.2 and 17.2). But we can go farther, and follow the course of each individual to determine the extent to which he remains in his classification. In order to do this, growth curves of deviations from the Todd norms, expressed in years and tenths, were plotted against C. A. for each case. From inspection of these curves it was clear that in most instances the children did not vary from the original classifications, which had been based on terminal status. Some children shifted in their relative status, and in a few instances these shifts crossed boundaries from one category to the next.

The cases whose shifts might have changed them from the original classification were counted, with the following results. Among the late-maturing boys, as originally classified, there are 3 who at most ages appear to be about average in skeletal maturity. One boy who was originally classed as average is seen by his deviation curve to be slow-maturing at most ages. At the other end of the scale, 4 of the average-maturing boys were at earlier ages somewhat advanced for their ages. One boy who had been classed as early-maturing was at most ages only slightly advanced, and perhaps should have been called average. Of the 77 boys, 7, or at the most 9, would fall in different categories at the earlier ages considered in the study; from 68 to 70 (88 to 91 per cent) would remain in the same maturity classifications throughout.

Among the late-maturing girls, 3 were actually somewhat accelerated in their first x-rays, but slow rates of maturing toward the end of their growth brought them at the last into the retarded group. Two girls who had been classed as average appear, by their deviation curves, to be at most ages somewhat retarded, but they are borderline cases and might be classed either way. Among the early-maturing group of girls there are none who were average at most ages, though two cases were so at their first x-rays and then accelerated rapidly. Four who had been classed as average were advanced at earlier ages, slowing down as they approached maturity. Again for the girls, 7 or possibly 11, would be in different categories at the earlier ages; leaving at least 84 per cent and probably 90 per cent in the same classification at all ages.

To summarize, classification based on earlier ages than those used would have changed a few cases but, as is apparent from Table 2, would have made little difference in the statistical findings. We see, however, that some children's rates of skeletal maturing are not consistent with the total group, and we may expect their rates of growth in other physical aspects to fluctuate in a similar manner. Hence we shall note whether children who do not consistently fit into our original skeletal age categories are deviates from the groups in other ways as well.

a. Racial Deviates

It has already been indicated in the preceding article (3) that the children in this study can, for the most part, be classified in a loose and general category which is composed of "Old Americans" (largely of North European ancestry) and more recently immigrated North Europeans (for the most part first generation in the United States). This is not a very homogeneous group, but is characteristic of many white populations in the United States. As noted in the description of this sample, a few of the children are of sufficiently different racial origin that it has seemed wise to examine the extent to which they differ from the main group before we include them unqualifiedly in our classifications.

Of the 11 boys who do not fit into the general North European-American group, 4 are Italians. Their ages at reaching a skeletal age of 17.25 years are: 15.1, 17.0, 17.7, and one who was not yet mature when data collection was discontinued, but was a year retarded at that time. These boys are spread throughout the range of maturing, with only one early-maturing. The Armenian and the Hungarian matured about 6 months early, the half-Jewish boy at average age. Of two who were part Spanish, one matured about 8 months early, the other 6 months late, the Mexican matured almost 2 years early, and the part Tahitian a full 2 years early. The average age of attaining Sk. A. 17.2 for the 10 boys who attained it, is 16.6 years, somewhat earlier than the average, which is 17.01 years for the total group (S. D. .79). They are distributed: 4 in the early-, 4 in the average-, and 2 in the late-maturing group. They comprise a little less than one-fifth of the early-maturing group, about one-ninth of the average, and one-tenth of the late-maturing group. If their physical builds are racially distinct from those characteristic of the larger group their preponderance in this early-maturing group might have some influence on the differences we have found between early- and late-maturing boys.

The anthropometric data for all of the children in the study have been converted into standard scores[3] for each (6-month) C. A. interval. Using these scores, individual curves of relative size in nine measures and two indices $\left(\frac{\text{bi-iliac}}{\text{height}}\right.$ and $\left.\frac{\text{weight}}{\text{height}}\right)$ had been plotted against age. In order to determine a child's relative size and build, all of his anthropometric curves were spread out and a short descriptive picture was made from them. Using these descriptions we may characterize the boys in the racially deviate group as follows: in terms of their adult status, none of these 10 boys is tall, 5 are average, 5 short; 6 are described as of wide or stocky build, 2 average and 2 slender. "Short and stocky" is the most frequent description (four cases). However, of the 4 who matured early only 2 are short, while 3 are broad-built and one rather narrow-hipped. These descriptions do not indicate any very impressive weighting of any of the three maturity groups which could be ascribed to racial differences, though the 2 late-maturing boys are short and stocky and not like the other late-maturing boys.

The 12 racially deviate girls present a somewhat similar picture. They are more often short (eight cases) and broad-built (seven cases) but not exclusively so. Only one, who is Jewish, is late-maturing and she is generally small - unlike the trends of late-maturing girls. Of the 5 early-maturing girls, 2 are short and stocky, one is tall and broad, one tall and average in build, while one (the Jewish-Roumanian-Russian) is average in height but with narrow hips. There is not, among these girls, any similarity in build that would alter, because of racial factors, the tendencies found for the total group of early-maturing girls. Although there is a greater frequency of both early-maturing and short, stocky builds, the two do not invariably go together. When compared (by inspection) with curves of the 20 other early-maturing girls they do not stand out as in any way characteristically different.

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[3] *These standard scores, or T-scores, were obtained by subtracting the individual's measure from the mean for that age and dividing this difference by the standard deviation for that age. In order to make all scores positive these S.D. scores were multiplied by 10 and then converted into a numerical series in which 50 represents the group mean.*

Means and standard deviations for the different groups, excluding the non-Nordic cases, are shown for three ages in Table 10. When these means are compared with those in Tables 1, 4, 5, 6, and 8, we see that for the most part the relationships remain the same, though the figures shift. The boys' data show that in height both extreme groups tend to be taller, but especially the late-maturing; both extreme groups tend to be slenderer-hipped in relation to height and to be a little longer-legged; that is, the elimination of the short, stocky non-Nordics changes the means of both extreme groups in the direction of taller and slenderer, but maintains the differences between the early- and late-maturing groups.

As for the girls, the elimination of the non-Nordics makes all groups very slightly taller, tends to emphasize the difference in biacromial width of the two extreme groups at 15.7 years, and has no effect on the means of the $\frac{\text{bi-iliac}}{\text{height}}$ index.

In this connection Shuttleworth's findings for a group of 33 Italian girls as compared with 193 North European girls, all from the Harvard Growth Study, are pertinent. He found a normal distribution of menarcheal age in both groups. In anthropometric dimensions "the North Europeans are consistently taller and... the differences in stature are due largely to differences in leg length. Differences in average sitting height, bi-iliac diameter, and weight are negligible. Considering the small number of Italians, the patterns generated by the annual increments of the two groups could hardly be more alike. The only consistent difference is that the pattern of growth in leg length among Italians is less intense" (6, p. 150). As our racially deviate cases are primarily Italian, these findings of Shuttleworth on Italians tend to corroborate our own data. In general, we seem to be justified in including all of the cases in our statistical treatment. On the other hand, the cases which do not fit into our general descriptive classifications are more likely to be from the short, stocky non-North European group.

TABLE 10

ANTHROPOMETRIC DATA FOR EARLY-, AVERAGE-, AND LATE-MATURING GROUPS, INCLUDING ONLY CASES OF OLD AMERICAN AND NORTH EUROPEAN STOCK

	Early-Maturing			Average-Maturing			Late-Maturing		
C.A.	n	Mean	S.D.	n	Mean	S.D.	n	Mean	S.D.
BOYS									
Height									
11.7	16	1519	72	26	1465	64	16	1463	36
13.7	17	1693	87	30	1597	73	19	1563	45
15.7	15	1783	81	29	1733	68	19	1721	51
Biacromial									
11.7	16	316	14	26	307	12	16	305	18
13.7	17	360	20	30	336	17	19	322	21
15.7	14	391	22	29	374	15	19	360	22
Bi-iliac / Height Index									
11.7	16	15.9	.64	26	15.8	.72	16	15.4	.48
13.7	17	16.0	.54	30	15.7	.70	19	15.4	.47
15.7	14	16.2	.59	29	15.8	.70	19	15.4	.40
Stem Length / Height Index									
11.7	16	51.5	0.9	26	51.6	1.0	16	51.0	0.9
13.7	17	51.0	1.1	30	51.0	1.2	19	50.2	0.9
15.7	15	52.0	0.8	29	51.7	1.2	19	50.4	1.0
GIRLS									
Height									
11.7	20	1518	57	19	1475	60	17	1441	82
13.7	19	1596	44	21	1596	53	19	1581	75
15.7	19	1619	45	17	1632	59	17	1639	57
Biacromial									
11.7	20	325	16	19	314	14	17	318	18
13.7	19	342	14	21	339	14	19	342	21
15.7	19	350	17	17	352	10	17	359	17
Bi-iliac / Height Index									
11.7	20	16.4	.77	19	16.4	.77	17	16.4	.61
13.7	19	16.7	.78	21	16.5	.88	19	16.4	.61
15.7	19	17.2	.88	17	17.2	.70	17	16.8	.66

b. Individual Builds in Relation to Rate of Maturing: Boys

To return to our question about differences in build which may be related to rates of maturing, let us inspect the growth curves of children from the extreme groups. Inspection of the boys' T-score growth curves give the impression that early-maturing boys characteristically have spurts of rapid growth, after which they slow down and to some extent approach the average; they are wide-hipped, and seldom below average in height. Sample curves for height are shown in Figure 24 for the 7 earliest-maturing boys. The early-maturing South European boys in this extreme group (F 13, F 5, E 10) tend to show the same growth rates and builds as the others, but they are only average or short in height as adults. If they were eliminated the early-maturing boys would stand out still more clearly as a tall group. Among the 21 early-maturing boys, only one curve fails to show a spurt of relatively rapid growth in height during the early years of the study, with a later period of slow growth (though in some cases the trends are very slight). The one exception (not shown) remains tall, and equally so, throughout. However; his curve of skeletal acceleration is almost concave in appearance, and from 14.5 through 16 years he was accelerated less than 6 months, and would have been considered average in skeletal development at those ages. Twelve of the 21 boys in this classification are relatively tall at all ages. Only 3 are below average height at all ages; 3 more drop slightly below the T-score of 50 at their final measure. Twelve of the boys have broad bi-iliac diameters relative to their own height; 4 are average in this respect, 3 slightly narrow-hipped, and 2 tall boys have relatively very narrow bi-iliacs. Of the 7 earliest maturing all have above-average $\frac{\text{bi-iliac}}{\text{height}}$ indices at most ages.

In general, as was to be expected, the individual growth curves show that most of the early-maturing boys fit the descriptions found for them when their measures were averaged; that is, most of them are consistently tall and broad-hipped.

In terms of the group means the late-maturing boys are long-legged and narrow-hipped. Inspection of individual curves shows that 8 of the 21 fit this description completely. Furthermore, of the 7 who reached a Sk. A. of 17.2 at 18.0 or later, 5 are in this group (Figure 25). Six boys are relatively narrow-hipped but not long-legged; though only one of them has a longer than average truck length for his total height. Five are relatively long-legged but not narrow-hipped; two of them being definitely broad-hipped. Two boys do not fit our general description in either respect. They are both short and broad-built, one of them being definitely short-legged. Both of these boys are of South European ancestry; although neither was extremely late-maturing (17.7 and 17.8 years), they were consistently rather slow-maturing and were both about a year retarded at 14 years of age when first x-rayed.

Silhouettes of a typical early and a typical late-maturing boy are shown at two ages in Figure 26. Note that at 13 years the late maturer is much the shorter of the two relative to his 17-year height. At the 17-year pictures the late maturer is a full year retarded in skeletal age; he does not reach the Sk. A. of 17.2 until he is 18.2 years old. On the other hand, the early maturer is already completely mature at 17 years; he attained

Figure 24

Individual Curves of Height
Early Maturing Boys

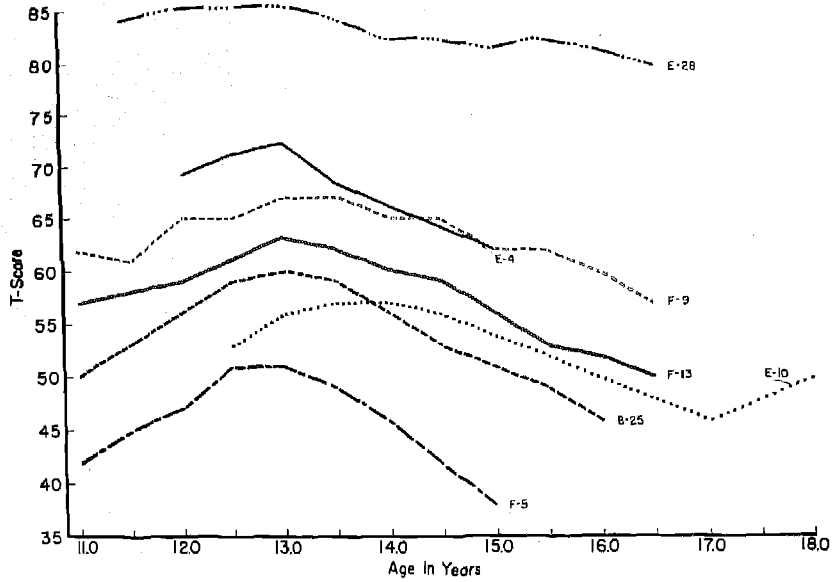


Figure 25

Individual Curves of Height
Late Maturing Boys

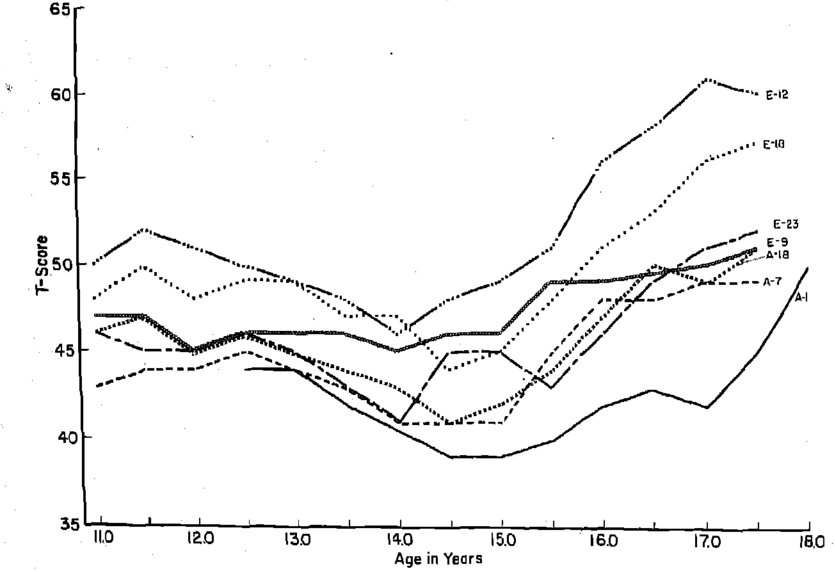
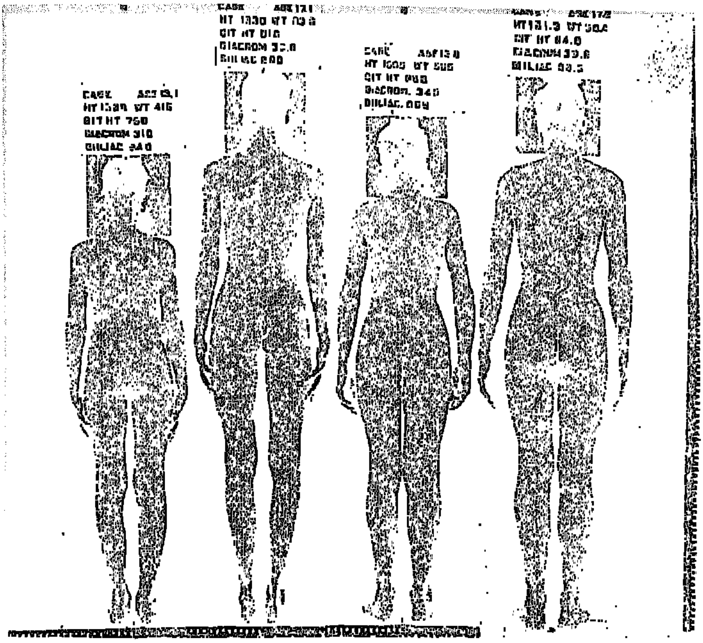


Figure 26



Sk. A. 17.25 at C. A. 15.7. The characteristic differences of build are evidenced in these silhouettes - the long-legged, slender build of the late maturer, and the short-legged, wide-hipped and generally heavier build of the early maturer.

Some typical ''word-pictures'' of the late-maturing boys, made from the inspection of their growth curves may serve as further illustrations.

Case A 1, Sk. A. 17.2 at C. A. 18.8. Height: short until 18.2 when he is average. Weight: light, parallels height T-score curve. Bi-iliac: narrow. Chest depth: very shallow. Chest breadth: narrow. Biacromial: very narrow. Bitrochanter: narrow. Stem length: short. Sitting height: also short. Chest circumference: small. Circumferences of thigh, leg, arm and neck: all small, approaching average at 18.2, the thigh measure attaining average. General picture of a slender-built, long-legged boy.

Case A 7, Sk. A. 17.2 at 18.3. Height: rather short but approaches and almost attains average at 17.0 and 17.5 years. Weight: light, approaches near to average with increasing age. Stem length and Sitting Height: short, tends toward average at later ages. Bi-iliac and biacromial: both narrow but approaching average, latter achieving average by 15.5 years. Chest Circumference: narrow, approaches average with increasing age. Chest depth: average, becoming thick after 14 years.

Chest breadth: very narrow, becoming more so. Circumferences of thigh, leg, arm and neck: start small, become average about 16 years, more or less. Generally small size until near maturity. Becomes adult of almost average height with a tendency toward slender build, but broad shoulders.

Case E 23, Sk. A. 17.2 at 18.1. Height: short early, above average after 16.5 years. Weight: light at all ages. Bi-iliac: very narrow. Biacromial and Bitrochanter: about average for height, though shoulders remain narrow at later ages when height increases. Sitting height and Stem length: average for height. Chest diameters: a little large for height. Circumferences: average for height. He is small at first, becomes average in height as an adult, is on the slender side, with very narrow bi-iliac and narrow shoulders.

c. Individual Builds in Relation to Rate of Maturing: Girls

The means for the early-, average-, and late-maturing girls do not show very marked differentiations in build, so we may expect to find few differences between the mature builds of the individual children in the two extreme groups.

Of the 28 late-maturing girls (19 in the statistical group and 9 who did not complete maturity within the period of measurement), all but 3 show increasing T-scores for height with advancing age. (Figure 27 shows the 7 latest maturing.) The T-curves of 2 of these 3 can be explained by an examination of their earlier records. One was actually accelerated before 16 years of age (her height curve reflects this) and the second was only about 3 months retarded before 16 years of age. On the other hand, we have no explanation for the third who was retarded about 9 months at all ages. If we describe build in terms of the $\frac{\text{bi-iliac}}{\text{height}}$ index, we find that 16 become increasingly broad-hipped at the later ages, ten of them exhibiting a flattened U-shaped curve, i.e., higher T-scores in this index in both the earlier and the later ages measured. Apparently these girls were relatively narrow-hipped for a few years because they were slow in maturing. Seven girls showed no directional trends in this index, while 5 have steadily dropping curves. Even though the expected trends occur in most cases, they do not always do so. Four of these 5 non-conformists have below-average indices at all ages - i.e., are slender-built, and are apparently cases who do not have marked growth spurts in hip-width. Of the 19 girls in this group who had reached mature status their curves show 8 tall, 6 average, and 5 short; with a symmetrical distribution of builds ($\frac{\text{bi-iliac}}{\text{height}}$ index) 5 wide, 10 average, and 4 slender. If we add the 9 whose growth is incomplete the tendency to be tall is still evident (11 tall, 10 average, 7 short) but there appears also to be a tendency toward slenderness (6 wide, 12 average, and 10 narrow); this latter tendency, however, appears to be only a matter of incomplete growth. There are 4 girls among the 28 who are short and stocky in build. Two others are both short and narrow-hipped.

Twenty of the 25 early-maturing girls have height curves which show a consistent decrease in T-scores with advancing age (Figure 28 shows the 7 earliest maturing) - in accord with the trend of the mean for this group. The 5 who do not, maintain fairly stable positions near the average with the exception of one consistently tall girl. The skeletal deviation curves for these 5 show that they are not among the extreme deviates in bone maturity; two were only average in the first x-rays and the other 3 were never as much as a full year advanced. As for the mature height and build of the early-maturing girls, the curves show 7 to be tall, 10 average, and 8 short, with 9 broad-hipped, 7 average and 9 narrow or slender-hipped (bi-iliac diameter). These frequencies do not show any strong trends toward extremes in either size or build. There is, however, among the individuals of the group a marked shift in relative status from large to small as they grow older.

It is evident from these summaries of cases that body build in girls is not (as it is in the boys) related to rates of skeletal maturing. The only relationship we find is a moderate one between rate of maturing and size; early maturers are relatively large from 10 to 12 or 13 years because of their early period of rapid growth; but they are small as adults, while late-maturing girls are more often just the reverse.

SUMMARIZATION OF SEX DIFFERENCES AND SIMILARITIES

In terms of average rates of skeletal maturing there are, as we have seen, about 2 years difference between the sexes in the age at reaching bone maturity (complete closure of the epiphyses of hand and knee). Our sub divisions within each sex have separated the children into 6 groups, which reach maturity successively, approximately one year apart, except for the early-maturing boys and the late-maturing girls whose age at epiphyseal closure is about the same. Furthermore, there is an overlap of 3 years (15.0 to 17.9) in the ages at which both boys and girls are reaching skeletal maturity. The question arises: are there differences in growth and build which show characteristic shifts in a masculinity-femininity series in agreement with shifts in age at maturing, or are the sex differences independent of this variable? The answers to this question are scattered throughout this and the companion paper,

Figure 27

Individual Curves of Height
Late Maturing Girls

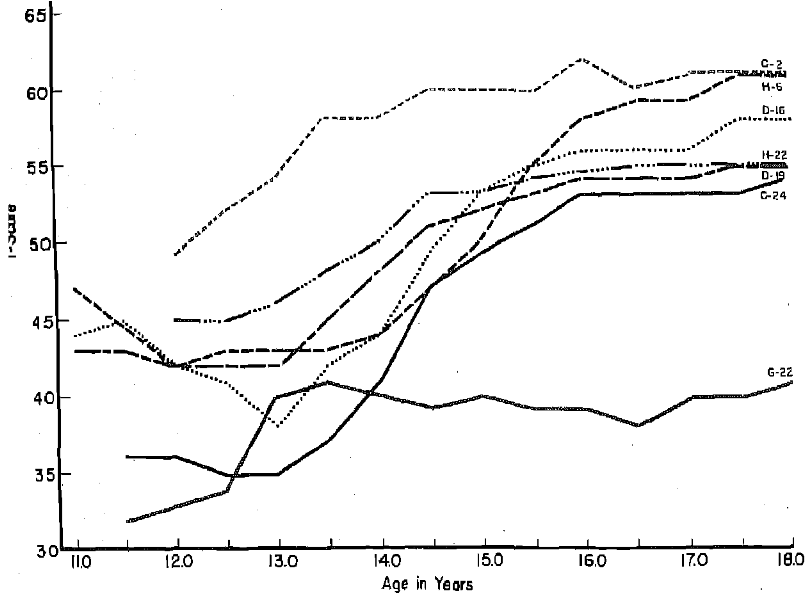
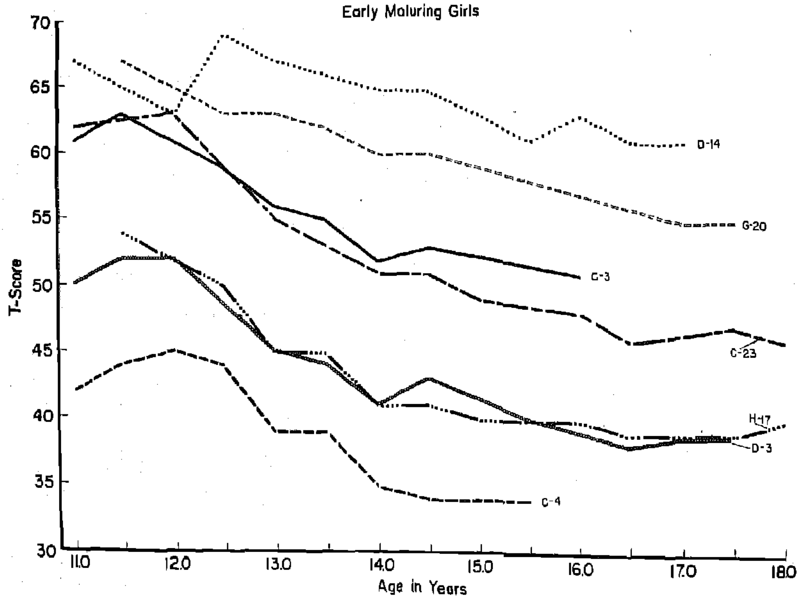


Figure 28

Individual Curves of Height
Early Maturing Girls



but it will be of interest to review them here with this question in mind.

The children in this study exhibit normal trends of growth in size as may be seen in the curves of the means for height, stem length, bi-iliac and biacromial diameters for the total groups (3, Figures 31, 32, 33, and 34). Furthermore, the sexes differ in their growth trends for each of these dimensions. We find that, as in other anthropometric studies, between 11 and 14 years of age, the girls average larger in all dimensions. But the boys overtake them, first in height at 13.5 years, then in stem length and biacromial diameter at 14 years. The girls maintain a slightly broader bi-iliac dimension, although by 16 years the means are practically identical.

When we consider early-, average-, and late-maturing groups, comparison of the growth curves in size shows that, regardless of rate of maturing the growth curves for the two sexes remain distinctive in their trends after the adolescent growth spurt starts. There is, for example, no tendency for the growth curves of the early-maturing boys to look more like those of the late-maturing girls, as compared with the average curves for each sex. There are, furthermore, additional sex differences in the relations between early and late-maturing groups:

(a) Height curves show reversal of the positions of the early- and late-maturing girls but no such reversal occurs among the boys (Figures 1 and 12).

(b) Among the maturity groups comparisons of the bi-iliac growth curves, adjusted to skeletal equivalence, reveal diverse trends, with the *early*-maturing boys and the *late*-maturing girls having the wider bi-iliac diameters (Figures 7 and 18).

(c) Biacromial width shows differences between maturity groups in the girls but not in the boys (Figures 8 and 19).

(d) The most striking sex differences are seen in the $\frac{\text{bi-iliac}}{\text{height}}$ index curves (Figures 9 and 20). The boys show no directional shift with age, but maintain significant differences between maturity groups, the early-maturing boys being relatively broad, and the late-maturing boys narrow-hipped. The girls, on the other hand, have $\frac{\text{bi-iliac}}{\text{height}}$ indices which rise rapidly for all groups alike after a skeletal age of 12.2. What is more, they are not differentiated in relative hip-width when compared for maturity groups.

(e) The greatest directional difference with increasing age is found in the $\frac{\text{bi-iliac}}{\text{biacromial}}$ index (Figures 11 and 21). The indices for the sexes are similar at first, but at a boy's Sk. A. of about 14.5 years they start to diverge; after this, the girls' indices increase and the boys' indices decrease, i.e., the boys become broad-shouldered and the girls broad-hipped. Here again the *trends* are characteristic of the sexes regardless of the age at which they start, though the actual differences are least between late-maturing girls and early-maturing boys.

(f) The $\frac{\text{stem length}}{\text{height}}$ index is the only one which has a similar trend for the two sexes (Figure 23). In fact, as we have already pointed out, the curves for five of the six maturity groups, when adjusted for skeletal equivalence, are almost superimposed, though the girls' curves tend to be very slightly higher; while the sixth group - the late-maturing boys - though still showing the same *trends*, have consistently lower indices (i.e., have shorter bodies and longer legs for their total height).

The foregoing résumé shows that in the matter of growth trends in absolute size and body build during adolescence, the sexes are for the most part distinct in their characteristics and are by no means extremes, or even a bi-modal distribution, on the same continuum. This is true so long as we use *rate* of growth changes as a basis for comparing the sexes.

However, when we compare the percentage curves the picture is different (3, Figures 35 and 36). When per cent of mature height and stem length are plotted against age, sex differences seem to be eliminated once the groups are equated for skeletal maturity. There appears to be a relation between the maturity of the skeleton and the proportion of completed growth, which is independent of sex.

In view of the sex differences found, it is of interest that the boys selected by the physician as most sex-inappropriate at some time during their growth do not follow these tendencies. None of these 6 boys is early-maturing - in fact, 3 of them fall into the late-maturing class. Their deviations are not at all in the "feminine" direction insofar as rates of maturing are concerned. They appear, instead, to be a-typical (perhaps a-sexual?) for a period during their growth.

SUMMARY AND CONCLUSIONS

Within a group of adolescent children (90 boys and 87 girls) close relationships were found between the process of skeletal maturing and growth in size. The members of each sex were subdivided into early-, average-, and late-maturing groups (three groups for each sex) on the basis of age at reaching a given skeletal age. In the girls the division was made according to chronological age at attaining a skeletal age of 16.25, or complete closure of epiphyses of the hand and knee. The boys, who mature on the average two years later than girls, were divided according to age at attaining the skeletal age of 17.25 years, or about one year before complete epiphyseal closure. In this study skeletal development has been the sole criterion for determining rates of maturing. On the basis of this criterion a number of differences in anthropometric dimensions were found to characterize groups who matured at different rates.

Early-maturing girls, as a group, are relatively large and the late-maturing girls are small before 13 years; while after this age their relative sizes are reversed. For their skeletal ages the late-maturing girls tend to be larger than average at all ages. There is also a consistent tendency for the early-maturing girls to be small for their skeletal ages.

Comparisons of the several groups of girls with reference to their body build, as measured in the $\frac{\text{bi-iliac}}{\text{height}}$, $\frac{\text{stem length}}{\text{height}}$, and $\frac{\text{bi-iliac}}{\text{biacromial}}$ indices revealed very little difference in build which could be related to their rates of maturing. Although the early-maturing girls are relatively broad-hipped and the late maturers narrow-hipped when compared at a given chronological age, the differences disappear if the comparison is made between girls of similar skeletal ages. The one difference which is consistent, whether determined on the basis of C. A. or Sk. A., is the $\frac{\text{bi-iliac}}{\text{biacromial}}$ index: the late-maturing girls tend to be broad-shouldered, especially when compared with the early-maturing girls.

Among the boys, the relations between the rate of maturing and growth in size are rather different from those found among the girls. For their chronological age early-maturing boys are relatively large at all ages; late-maturing boys are small between the ages of 11 and 16. When compared at the same skeletal ages, these differences disappear, with one exception - early-maturing boys have relatively broad hips at all ages, especially as they grow older. The indices of build show the late maturers to be characteristically slender-hipped and long-legged, while the early maturers are typically broad-hipped.

The differences found do not appear to be due to racial or national characteristics. Although the small number of Italians and other South Europeans in the study tend to be short and broad-built, they were not consistently so, and were found in all maturity groups. Elimination of these cases did not alter the relationships found between groups maturing at different rates.

Descriptions of the cases who were most deviate in rate of maturing, corroborate the statistical differences found for the larger groups.

It is to be concluded from the summarization of sex differences that we cannot say that early-maturing boys are characteristically more feminine, or late-maturing girls more masculine in their directional trends of growth. It is true, however, that in some characteristics the deviations are in this direction: early-maturing boys tend to have broad hips and narrow shoulders (which is nearer to the girls' norms) while late-maturing girls tend to be larger and to have broader shoulders (that is, nearer to the boys' norms in these characteristics). Late-maturing boys, on the other hand, are most deviate of all the groups and would, all in all, contrast most markedly with the early-maturing girls.

There is one type of comparison, however, in which sex differences practically disappear. If we control the degree of skeletal maturity, by adjusting for the two-year sex difference in bone maturity during these adolescent years, then the growth curves for per cent of mature height are closely similar for the two sexes. The same is true for per cent of mature stem length. This may be another indication that growth in size is closely related to the processes of maturation of the skeleton. Eventual size may be primarily determined by such factors as sex and other innate characteristics, with a child's progress toward that mature size (proportionate growth) occurring at the same rate that his skeleton matures. If this is true, then roentgenograms of a child's hand and knee should serve as excellent indicators of the proportion of his growth which he has completed at any given time.

The results of these studies have several interesting implications for possible relationships to other characteristics of adolescent development. It is planned to present, in later publications, data on relationships of rates of maturing and body build to such factors as strength, skill in motor abilities, and social and emotional adjustments. Preliminary studies (2, 4) have shown that when children are classified according to the age at which they reach skeletal maturity, there are significant differences among boys in strength and motor abilities as well as in size and build. There is a further indication that deviations in rates of maturing are also accompanied by some differences in personality characteristics which seem to be in part related to the stage of maturity, and in part a reaction to social acceptance and status as it is affected by their physical deviations.

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ACKNOWLEDGMENTS

This study is based on a portion of the data assembled in the Adolescent Growth Study of the Institute of Child Welfare of the University of California.

I am indebted to the children who served as subjects, and to the members of the staff of the Adolescent Growth Study. I wish to acknowledge, especially, the contributions of Dr. Herbert R. Stolz who planned the program of physical examinations and anthropometric measurements, and who participated in the program of data collection. Dr. Harold E. Jones and Dr. Herbert S. Conrad have given valuable assistance in suggestions for the research, and in critical reading of the manuscript.

Assistance in the preparation of the materials was furnished by the personnel of the Works Progress Administration, Official Project 665-08-3-30 A26.

AFFECTIVITY AND GROWTH IN CHILDREN[1]

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INTRODUCTION

The affective or feeling side of personality is playing a role of increasing importance in current research in child development. Whenever one wants to know how children learn, why they behave as they do, or even to fully appreciate their states of health, he must sooner or later find out how they "feel" about the situation.

The importance attributed to affectivity or feeling states in general psychological literature is apparent throughout the history of psychology. The general historical trend seems to have been in the direction of gradually establishing a closer connection between mental and physical functions. Affectivity has been conceived as related to mental and physical processes in varied and contrasting ways. As psychologists join and relate the mental and the physical, affective areas must then be investigated in terms of both.

The present study of the affective area of personality adds another approach to the problem attempted by the University of Michigan growth studies, that of describing the "whole" child through time. Olson and other members of the University Elementary School staff have been engaged for the past decade in collecting continuous growth records of the children enrolled in the preschool and elementary grades. The general point of view of the growth studies has been that the unique problem of research in child development is to see what the child as a whole is like now, what he was, and what he may be later. When an individual child is chosen for special study he is less often compared with others and more often studied by comparing his present status with his own previous status. The University of Michigan growth studies have emphasized consecutive measures of height, weight, dentition, wrist bone development, educational achievement, mentality, strength of grip, and maturity of interests. In order to portray growth data collected in many types of units in an understandable manner all measurements have been translated into age units, such as height age, weight age, and dental age. Thus, all objective data can conveniently be plotted on a single graphic growth record. When a generalization is needed concerning a child's status at a given time all of the above-mentioned measures are averaged and the composite age thus derived is designated "organismic age."

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[1] *The writer was, at the time of the study, a member of the staff of the University of Michigan Elementary School and collected these data as a companion document to the Growth Studies still in progress there under the direction of Dr. Willard C. Olson.*

When considering the above measures from the "whole" child point of view it is evident that personality and social areas are not represented to any appreciable degree. Several attempts have been made previously to sample these areas and to relate them to total growth patterns. Studies on the personality and social areas include measures of social age, handwriting, seeking tendencies, and interests. Conclusions suggested by all of these investigations place personal and social factors within the totality in much the same way as physical and mental items relate to each other.

A measure of affectivity has thus been sought, to be subsequently related to growth patterns which already include various measures of physical and mental functions.

A PLAN FOR THE STUDY OF AFFECTIVITY

A survey of methods most commonly used to investigate personality revealed frequent use of standardized tests and rating scales, questionnaires, systematic observation, physiological measurements, case studies, psychoanalysis, and projective techniques. None of the existing tests or scales seemed adequate to sample affectivity in children, because it was felt that the sample should be obtained from the children directly to avoid some of the errors of judgment and interpretation. Furthermore, the prospective subjects for the study were young children for whom complete growth data were available and who would be unable to read test material. Existing questionnaires were likewise too difficult to be used by the children, and, in addition, they usually were directed toward sampling more specific traits than was sought in the more general concept of affectivity. Observational methods were discarded as too complex to lend themselves to the general description. Physiological studies of personality require the use of technical laboratory equipment which was not available. The case study method offered possibilities for describing individual children but did not lend itself to statistical analysis so that interrelationships between affective factors and other measures could be determined. Psychoanalysis requires the services of a skilled analyst and could not be conducted adequately by the worker trained in other frames of reference. Projection (the act of externalizing, or of perceiving an object as spatially and sensibly objective) assumes a certain amount of transfer from an abstract idea to a concrete object and interpretation is often difficult.

In order to study affectivity or feeling states in children it was believed that the children would have to project their feelings in some way onto material which was understandable and meaningful to them. Abstractions and general affectivity terms would not be expected to have meaning for children. Consequently, it was decided to borrow a method commonly used to obtain data for case studies and psychoanalysis, that of the personal interview, and to consider the responses to the interview as verbal projection structured only within the limits of the questions asked. In this way affectivity could be studied without the limitations of equipment, personnel, inability of the subjects to read or write, or the specificity of traits obtained in many experimental procedures. The assumption must be made, however, that the answers to interview questions actually measure affectivity.

Once the material concerning affectivity in children is obtained from the personal interviews it can be related to all other information comprising the growth records of the children involved. Since repeated measures had been made for all other samples of growth, it was decided to interview the children at least twice in order to study the relationship of affectivity to the composite growth status at a given time and also to the direction of change which growth patterns were taking during the time when the study was in progress.

Since the purpose of the investigation was to sample the affective side of the child's personality, interview questions were selected with that purpose in mind. Three sources were tapped in order to obtain statements or questions descriptive of personality

1. Standardized personality tests and rating scales.
2. Publications reporting clinical aspects of personality study.
3. Textbook discussions of personality.

Items which became familiar with repeated inclusion in different survey sources were recorded and restated in simple interrogative terms as closely resembling the original items as possible. A minimum of five appearances in surveyed material was necessary for inclusion of the statement in the experimental interview questionnaire.

Seventy-five questions were obtained by the method described above. An initial series of interviews was scheduled to perfect the interview blank and technique and also to discover suggestions for subsequent treatment of results. The children were scheduled individually and the interviews took place in a private office with which the children were familiar.

No one was present except the interviewer and interviewee. All questions were asked orally and the interviewer recorded the subject's responses as inconspicuously as possible. Several minor revisions of questions, elimination of four ambiguous or confusing questions, and minor refinements of the interviewing technique resulted from the initial series of interviews. The final revised interview blank thus contained 71 questions.

SCORING METHOD

In order to obtain a statistical analysis of the interview material, the revised interview blanks were administered to several adult groups trained in child development. These 150 adults were instructed to write in the preferred response to each question, "preferred" meaning a response which would seem to indicate a positive state of affectivity, happiness, or contentment. Collective judgments of the adult groups were used to allot one score point to every preferred response recorded so that a high numerical score would indicate a high level of affectivity and a low numerical score a low level of affectivity. Since several of the 71 interview questions contained more than one part, and one score point was allotted for each preferred response the highest obtainable total score for the revised interview became 81. A sample revised and scored form of the interview blank appears on pages 95-101

DESCRIPTION OF SUBJECTS

The experimental group for the first series of interviews was composed of 30 boys and 35 girls ranging from 86 months to 149 months in chronological age and from 90 months to 210 months in mental age. They were all regularly enrolled pupils in the second, third, fourth, fifth, and sixth grades of the University Elementary School. After the graduation of the sixth grade group in the first series, there remained 44 children for the second series the following year. The second series of interviews, then, was administered to 20 girls and 24 boys ranging from 96 months to 144 months in chronological age and from 97 months to 206 months in mental age.

DISTRIBUTION, RELIABILITY, AND VALIDITY OF AFFECTIVITY SCORES

Scoring of the interview blanks revealed the range of affectivity on the first series of interviews was from 35 to 70, with a mean score of 55.0 and a standard deviation of 7.9; on the second series the range was from 39 to 74 with a mean score of 54.7 and a standard deviation of 8.0. Therefore, it

Personal Report Blank (Mechem)

Name William Jones (42) Date 1-24-40

Age 120 mos. Sex M. Grade 5

| 1.	How are you getting along this year?	Half O.K. Same as last year.
| 2.	Are there any new children in your room this year? Do you like to have new children there or would you rather the same ones would stay every year?	Like new ones. There's a beautiful voice on Mary, the new girl. I just sit and listen to her.
| 3.	Which part of your work do you like the best?	Science, singing, art, arithmetic.
| 4.	Are you working with someone or mostly by yourself? Would you rather be alone a lot?	By myself No
5.	Is your school work easy for you? Does it bother you much if you cannot do something that you are trying to do?	No. I can't read. Yes, I feel I'm dumb.
| 6.	Are you shy?	No, but I blush and get mad when girls kiss me.
| 7.	Are your teachers usually nice to you?	Yes
| 8.	Do your teachers talk to you more than they do to other children in the room? Would you rather they talked to you less? Why?	Yes No.

	9. Do you always tell the truth?	No. When I get in trouble, I lie out of it.
2	10. Do you get along all right with the other boys and girls in your room? Do they seem to fight you more than they do other children?	Yes No
	11. Are you as large as other children your age? Do you wish that you were larger? Smaller? Why?	No. Yes, larger. Fight better.
	12. Do you sit and dream about things when you are awake?	Yes, fairy tales
	13. In sitting, do you wiggle and squirm?	Yes
	14. Do you get tired easily?	No
	15. Do you like to go to bed at night?	No
	16. Do you have a hard time getting to sleep at night?	Yes, I lie and think about things
	17. Do you like to get up in the morning?	No!
	18. Do you talk about your friends to other people?	yes, lots
1	19. Do you always laugh when someone falls down? When someone makes a mistake?	No. Sometimes – it's funny.

	20.	Do you cry very often? What makes you cry?	Yes. when mad or my feelings hurt. Or can't have my own way. Never when hurt.
	21.	Do you think that you have a bad temper?	Yes, very - a Dutch one.
2	22.	Do your parents treat you as well as they do your brother or sister? As well as other families treat their children?	Better. Better
|	23.	Do you have an allowance? Is it large enough for you needs?	No. Can have money whenever I want it
	24.	Do you wish that you did not have to go to school?	Yes.
	25.	Do you think that policemen are usually fair?	No! they arrested my Dad for speeding outside of city limits, and he wasn't going too fast. It wasn't fair there, or at Wayne either, another time. You can't see city limit signs.
	26.	Do you like to talk about your troubles with other people?	Yes. I went yesterday to see Miss W. in Detroit to talk over my Troubles, and get smarter.
|	27.	Do you feel glad when a friend does something better than you could do?	Yes.
|	28.	Would you rather have light hair (if dark) or dark hair (if light)?	No
	29.	Do you think that you talk louder than your friends?	Yes, much.
|	30.	Do you usually answer people the first time they call you?	Yes

	31. Do you think that it is fun to pretend?	Yes, about fairies, and forts, and soldiers, and animals.
	32. Do you eat a lot?	No, I only weigh 86.
	33. Do you like most foods?	No, I hate lots of things.
	34. Are your feelings easily hurt?	Very
|	35. Do you sometimes feel glad one minute and sad the next?	No
	36. Who is your favorite movie star?	Judy Garland, Errol Flynn, Mickey Rooney.
|	37. Do you seem to break or tear more things than your friends?	No
|	38. Have you ever fainted? When?	No
2	39. Did you ever run away from home? Ever want to?	No No
	40. Do you dream at night?	Yes, bad dreams usually. Last night Dad told me to count sheep. I count Tarzans swimming along trees to go to sleep. Sheep won't jump for me. I'm always falling in my dreams. It's a terrible sensation.
	41. Do you bite your finger nails?	Yes, and pick them, too.
	42. Do you have a light on in your room before you can go to sleep?	Yes, in hall.

2	43.	Do you have a dog, cat, or other pet? Do you always treat him nicely? Do you like to take care of him?	Dog Yes No
	44.	Do you ever wish that you had never been born?	Yes, when mad about not having my own way.
|	45.	Do you comb your own hair?	Sometimes
|	46.	Do you use the telephone by yourself?	Yes
|	47.	Do you buy any of your own clothes? Pick them out?	No Yes
|	48.	Do you ever feel that you almost hate yourself?	No. I usually love myself.
	49.	What do you like to listen to on the radio?	Jack Armstrong, Little Orphan Annie, Pinocchio, I Love a Mystery.
|	50.	Do you have regular jobs to do at home? Enough?	Yes, but usually I don't do them. Yes, I mean no.
	51.	Would you like to be the brightest child in your room?	No, but would like to be up with some of the other kids, though. You know in our room the best athletes are the dumbest, Joe and John. I'm third from bottom and I'm good in athletics, but NOT in schoolwork.
|	52.	Do you ever stutter?	No
2	53.	Do you like to tease people? Like to be teased?	No No
|	54.	Do you pick out your own books to read?	Yes.

55. Do you usually do what you are told?	Yes.
56. When you play games would you rather be Captain or just one of the players?	Player
57. Do you like to have someone else tell you how to do things?	Yes
58. Do you like to see automobile accidents?	Yes, if no one hurt
59. Do you want your own way most of the time?	Yes
60. Do you get stage fright?	No
61. When do you think you have more fun? When you are a little child? When you are about ten? XX When you are grown up?	Have the most games
62. When you are talking to someone, do you talk a lot about yourself or mostly about other people or things?	Things
63. When things go wrong do you get angry?	Yes
64. Do you have spells of the 'blues'?	No
65. Do you have a hard time making up your mind about things?	Yes
66. Do you wish that you were a boy (if girl) or a girl (if boy)?	Yes, because I'm lazy and girls' don't have to work so much.

67. Do you like to go to parties?	Yes, but I'm never invited, except once in a long time.
68. Are you lucky?	Yes.
69. After you make up your mind not to do something do you ever do it anyway?	Yes
70. Does your body ever seem stiff so that it hurts you to move around?	Yes, I get terrible pains in my back and stomach when I bend over.
71. If you order something to eat in a restaurant and it is not good do you tell the storekeeper about it?	No. Leave it, or have Dad tell them.

can be said that for the population studied there was stability of central tendency and of the amount of variation of affectivity for the two consecutive series of interviews. Changes which occurred in affectivity scores for individual children or for grade groups on the second interview as compared to the first thus operated within a stable central tendency for the total group.

In order to determine intrinsic reliability scores for all children the odd-numbered questions were correlated with scores on even-numbered questions in both series of interviews. For the first series this odd-even correlation of items as determined by the Pearson Product-Moment method was .70, expressing the reliability value for either half used singly. By applying the Spearman-Brown Probability formula, a value of .82 was obtained as an expression of the reliability of the total interview. For the second series with the reduced number of subjects the odd-even items correlated with a coefficient of .58, and a combined reliability of .74. These reliability values are considered adequate for the population studied, in so far as the scores derived reflect general trends in subjective areas for comparison with growth material.

Stability of affectivity scores for the same children at the time of the first and second interviews was determined by correlating their consecutive scores, in which case a coefficient of .70 was obtained.

The question as to whether the interviews as administered actually measure what they purport to measure, namely affectivity in children, has not been completely determined. For the purpose of this study, the general designation of affectivity has been applied to the interview findings.

RELATIONSHIP OF AFFECTIVITY TO OTHER MEASURES

Associational analyses were made between affectivity scores and various other measures, including organismic age, growth rate, organismic status (organismic age minus chronological age), organismic status excluding physical factors, mental age, educational age, developmental age, average deviation of all measures on a single child, problem tendencies and extroversion-introversion.

Organismic Age

Associational relationships were determined by applying the Pearson Product-Moment Correlation coefficient to affectivity scores and each of the other measures listed above.

Affectivity scores bore no definite relationship to organismic age for the group as a whole (Pearson r's for the two series of scores were -.04 ± .08 and -.10 ± .10 respectively). It was then decided to separate the children into grade groupings to see if organismic maturity functioned in a social setting in such a way as to influence affectivity. The assumption was that children would be better able to sense their comparative organismic maturity in the group in which they lived than in the composite experimental group. By so doing the relationship between affectivity and organismic age was increased from -.04 to .32 for the first series of interviews and from -.10 to .19 for the second series. The children who ranked as more mature within their school grades tended to be happier as judged by affectivity scores. It would seem, then, that the sociologic sphere in which the subjects lived has some influence upon the level of affectivity. If this trend were to be substantiated with larger groups and repeated measures, it would have numerous implications for the classification and placement of pupils within the school organization.

Growth Rate

The Pearson r computed between the direction affectivity scores took between interviews and organismic growth rate (average growth rate per calendar month for all measures on each child) was .37 ± .09. Thus, the suggestion emerges that children who are growing at a more rapid rate are somewhat happier than those who are growing more slowly.

It was further determined that affectivity scores were inclined to increase slightly during the interval between interviews for children whose rank in organismic age within their grade groups improved in the same interval. Affectivity scores decreased for those whose group status decreased.

It seemed plausible that a child might reflect affectivity in a change within his own rate of growth more than he would in a comparison of his own rate with the rates of others. Consequently, the growth rates of individual children for the duration of the experiment were compared with the growth rate which was typical for their complete school records. The Pearson r resulting from relating change in the child's growth rate during the experimental interval with change in affectivity during the same interval was .45 ± .08. Thus, the direction of affectivity was influenced more by change within a child's own growth picture than by comparison with changes exhibited by the group as a whole.

Organismic Status

Since organismic age (the average age of all measures) did not in itself express acceleration or retardation, a method was then devised to adjust for these factors. The child's chronological age was subtracted from his organismic age to obtain a positive or negative figure which would describe his status in relation to his age. For example, a child of 120 months whose organismic age is 129 months would have an organismic status of +9 months, indicating that he is 9 months accelerated in his organismic development.

It has already been shown that organismic age alone bears no apparent relationship to affectivity scores. It is also established that there is very little relationship between organismic status and affectivity scores (Pearson r .19 ± .08). If, however, the child's organismic status is compared with the organismic status of other children within his school grade, a trend emerges. Children with high affectivity scores tend to rank high within their grades in organismic status, and vice versa (Pearson r .42 ± .07 for the first series and .29 ± .09 for the second series). Thus, the sociological setting, in this case grade grouping, seems to influence affectivity with regard to organismic age and status. It would therefore seem that children become affectively aware of their organismic age and status only by comparison with the other children who comprise their groups and never by self-evaluation.

A correlation of .43 ± .08 was obtained between the direction affectivity scores took during the interval between interviews and change in organismic status in the same interval. This value may be interpreted as suggesting that while these children do not react affectively in any uniform way to absolute organismic status they do react to change. When this directional analysis was made within grade groups the resulting relationship is expressed by a Pearson r of .45 ± .08. Thus, children who improved their status improved slightly in affectivity, and children whose status suffered in the interval tended to decrease in affectivity.

Organismic Status Excluding Physical Factors

The analysis of organismic status data for individual children in the study suggested that the most accelerated children selected by this method were usually large in physical stature. At this point the assumption was made that possibly too great a premium was being given to large children and too great a penalty was being inflicted upon small children in so far as affectivity was concerned. Consequently, a new organismic status was assigned each child which excluded measures of height, weight, grip, dentition and wrist bone development and retained only the composite of mental achievement and personality factors. This composite status was then compared with chronological age in the same way as for the organismic status data described in the preceding section. The Pearson r's obtained between this new organismic status which excluded physical factors were .43 ± .08 for the first series and .21 ± .09 for the second series.

When, however, organismic status excluding physical factors was related to the child's rank within his grade group, the relationship to affectivity rose to .55 ± .06 for the first series and .54 ± .09 for the second series. Grade classifications, therefore, seem to add significance to affectivity as related to organismic status in factors exclusive of physical ones. Likewise, affectivity seems to be more closely related to nonphysical than to physical factors in the child's development.

Affectivity and Other Measures

Associational analyses such as those described above were made between affectivity scores and various other measures including mental age (Kuhlmann Binet), intelligence quotient, educational age (Stanford Achievement Test Scores), developmental age (Furfey-Sullivan Developmental Age Scales), average deviation of all measures, problem tendencies (Haggerty-Olson-Wickman Behavior Rating Schedules), and introversion-extroversion (Marston Scales).

The following additional relationships are thus described briefly:

1. No clear-cut relation was found between mental ages derived from Kuhlmann Binet tests and affectivity (Pearson r .09 ± .08 for the first series and .01 ± .10 for the second series).
2. When the children were separated into grade groups mental age and affectivity scores correlated positively (r's .38 ± .07 and .33 ± .09).
3. Children whose affectivity scores increased in the interval between interviews tended to gain more in mental age than those whose scores decreased (r .28 ± .09).
4. When the children were separated into grade groups the same positive trend persisted between increase in mental age and increase in affectivity scores (r .29 ± .09).
5. In order to hold the age factor constant, intelligence quotients were related to affectivity scores with resultant positive correlations for the two series of .25 ± .08 and .25 ± .09.
6. There was no discernible association between affectivity scores and Stanford Achievement Test educational ages for the population studied (r's .01 ± .10 and .03 ± .12).
7. When the children were separated into grade groups a positive relation was found between affectivity scores and educational age (r's .42 ± .08 and .29 ± .11).

8. A slight negative correlation (-.27 ± .11) was obtained between change in educational age and change in affectivity in the interval between interviews. However, a much smaller number of cases was involved (29) due to the lack of educational age measures for some of the youngest children each year.

9. Children with higher developmental ages as determined by the Furfey-Sullivan Developmental Age Scales tended to have slightly higher affectivity scores (r's .17 ± .13 and .06 ± .11).

10. When the children were separated into grade groups, developmental ages and affectivity scores correlated positively to the extent of .21 ± .13 and .10 ± .11.

11. Children whose affectivity scores increased in the interval between interviews tended to earn higher developmental ages at the time of the second rating (r .34 ± .12).

12. Children whose developmental age ranks within grades improved in the interval tended also to increase their affectivity scores (r .29 ± .12).

13. Affectivity scores did not reflect homogeneity or heterogeneity of growth pattern. Correlations of -.06 ± .08 and .13 ± .10 were obtained between average deviations of all measures and affectivity scores.

14. When grade groups were handled separately affectivity correlated very slightly with average deviation of all measures (r's .10 ± .08 and .04 ± .10).

15. It has already been shown that fast-growing children obtain slightly higher affectivity scores than do slow-growing children. It was further found that the average deviation of all measures was slightly higher for fast-growing children. A low positive correlation (.17 ± .10) between deviation of measures and affectivity scores lay therefore in the expected direction.

16. Children whose affectivity scores increased in the interval between interviews also tended to raise their average deviation ranks within their grade groups in the same interval (.19 ± .10).

17. Children with higher affectivity scores tended to exhibit fewer problem tendencies as rated by the Haggerty-Olson-Wickman Behavior Rating Schedule B (r's -.32 ± .07 and -.39 ± .08).

18. Children whose affectivity scores increased in the interval between interviews tended to receive slightly lower problem tendency scores at the second rating (r -.28 ± .09).

19. There was no apparent association found between affectivity scores and extroversion-introversion as measured by the Marston Scales (r's -.06 ± .08 and .08 ± .10).

THE RELATION OF AFFECTIVITY AND JOURNAL MATERIAL TO GROWTH IN SELECTED INDIVIDUAL CHILDREN

Relationships thus far described have been confined to groups. Evidence has been presented which suggests that affectivity scores do reflect growth levels, rates, and changes within groups.

Recent research in child development exhibits an increased awareness of the added information to be gleaned from studying individual children through time in addition to group comparisons.

In order to relate the nature of affectivity as measured by experimental interviews to total growth patterns in individual children, four cases have been chosen for special presentation. These four cases represent the four possible classifications to be made from affectivity scores.

a. The subject (case B 46) whose consecutive affectivity scores remained uniformly lowest in the population studied.

b. The subject (case B 34) whose consecutive affectivity scores remained uniformly highest in the population studied.

c. The subject (case G 31) whose consecutive affectivity scores decreased most markedly in the interval between interviews.

d. The subject (case B 2) whose consecutive affectivity scores increased most markedly in the interval between interviews.

Detailed descriptions of interview responses have been supplemented by records kept by the school psychologist, doctor, and teacher to portray the chosen four children as they impress the school personnel with whom they come into contact. Complete growth curves have then been drawn (Figures 1, 2, 3, and 4) to view the relationship of affectivity scores to the "whole child" point of view.

a. Case B 46 (Figure 1) is a boy whose consecutive affectivity scores were 44 (-1.4 sigma) and 42 (-1.5 sigma) which are uniformly low. At the beginning of the experiment he had a chronological age of 9 years and 3 months, a mental age of 9 years and 4 months, a reading age of 7 years and 11 months, a developmental age (Furfey Developmental Age Scale) of 10 years and 11 months, and an organismic age of 9 years and 7 months. His Haggerty-Olson-Wickman problem tendency score was 115, which is far above the mean in an undesirable direction (Norm for boys 72.4).

Figure 1 portrays B 46's complete growth picture from the time of his school entrance to the last available measure. Along the abscissa has been plotted his chronological age in months;

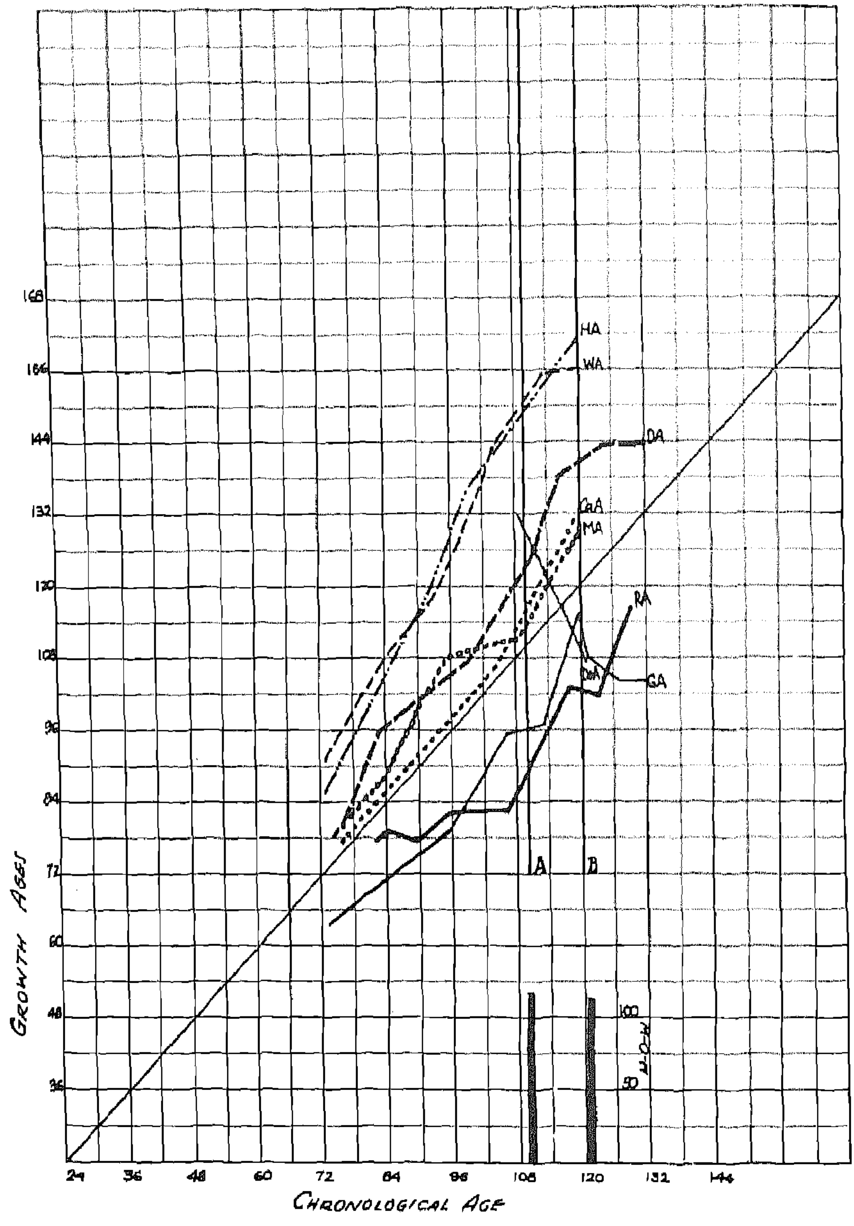

Figure 1. Growth record for boy (B 46) whose affectivity score remained uniformly low in the interval between interviews.

along the ordinate his growth ages as measured in months in the various areas indicated: HA (Height Age), WA (Weight Age), DA (Dental Age), CaA (Carpal Age), RA (Reading Age), DeA (Developmental Age), and GA (Grip Age). The perpendicular lines A and B represent the times at which the first and second affectivity interviews took place. The two dark perpendicular lines placed on the base line portray the Haggerty-Olson-Wickman Problem Tendency Scores obtained at the same time the interviews were scheduled. The solid diagonal line across the growth pattern represents a line of average; that is, it follows the line which a growth pattern would take if exactly average in all respects.

Thus, it can be seen that B 46 is a boy with uniformly low affectivity who presents a growth picture in which there is a marked discrepancy between his achievement and the rest of his development and whose behavior is often at variance with teacher and group standards. The segment of his growth pattern which falls between the two experimental interviews does not differ noticeably from other segments in the span presented. This is interesting since B 46 was chosen because his affectivity score remained uniformly low in the same interval.

Supplementary journal material on B 46 confirms the picture of maladjustment throughout. School staff members make frequent references to tensions, nervousness, parental discord, "sissiness," over-protection, nail-biting, daydreaming, unpopularity, insomnia, frustration in school work, hyperactivity, shortness of attention span, self-criticism, and a superfluous number of accounts describing behavioral difficulties.

From the "whole child" point of view, all above data seem to be in complete accord.

b. Case B 34 is a boy whose consecutive affectivity scores were 66 (+1.3 sigma) and 74 (+2.2 sigma) which are uniformly high. At the beginning of the experiment, he was 7 years and 5 months old, had a mental age of 9 years and 5 months, an educational age of 8 years and 9 months, and an organismic age of 7 years and 9 months. His Haggerty-Olson-Wickman problem tendency score was 51, which is far below the norms for boys in a desirable direction (Norm for boys 72.4).

Figure 2 shows B 34's growth pattern in the same way as for the preceding case of B 46. It is interesting to note that the curves off B 34 approximate a mirror image of those for B 46. All curves which fall below the line of average growth are physical measures, height age, weight age, and carpal age. B 34's problem tendency scores are shown along the base line and are seen to be uniformly low.

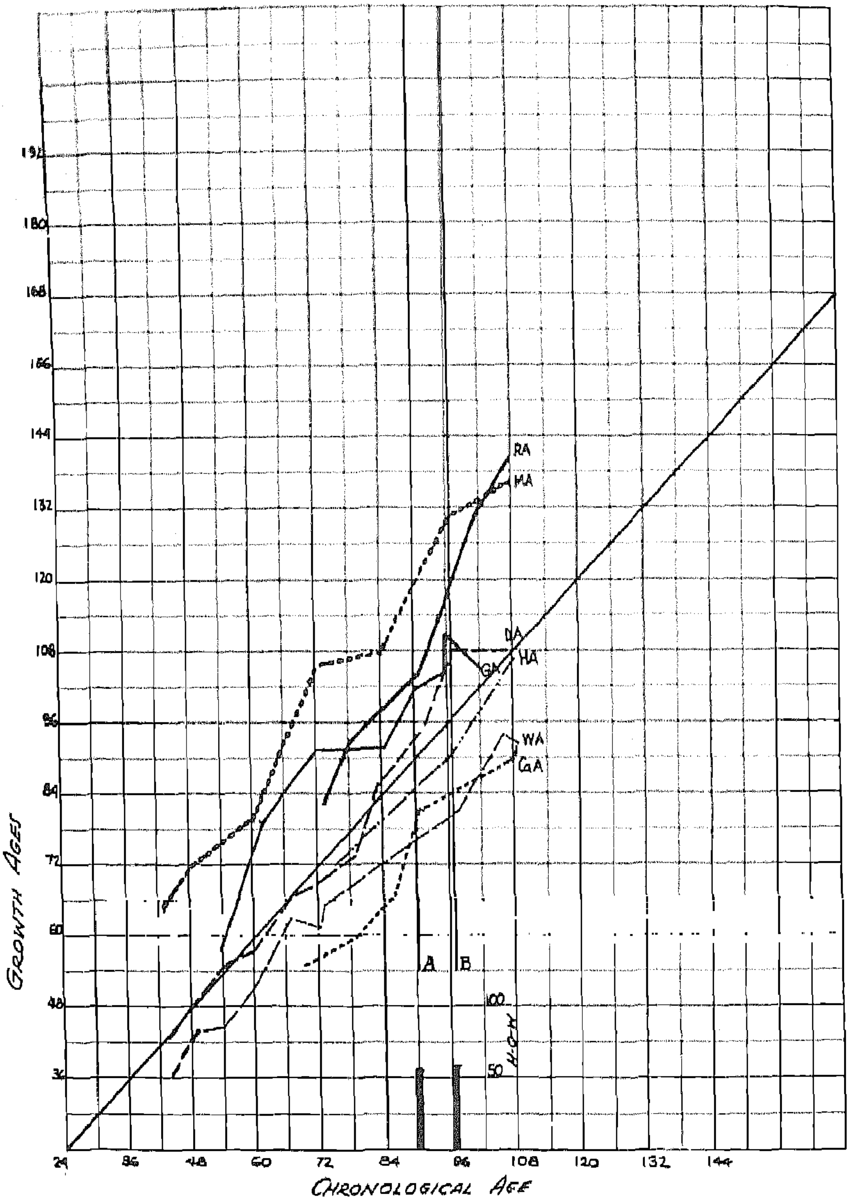

Figure 2. Growth record for boy (B 24) whose affectivity score remained uniformly high during the interval between interviews.

B 34, then, contrasts clearly with the preceding case. He is a small boy with high achievement and low problem tendencies. As in the case of B 46 there is no uniqueness of the growth segment between interviews as designated by perpendicular lines A and B. B 34 was chosen for special study because his affectivity score remained uniformly high in the experimental period, so the sameness of his concurrent growth picture is especially significant.

Supplementary journal material on B 34 stresses his leadership qualities, creativeness, excellence in academic areas, popularity, wide range of interests, poise, self-sufficiency, perseverance and general impression of well-being.

c. Case G 31 (Figure 3) is a girl whose consecutive affectivity scores were 70 (+1.9 sigma) and 54 (-.11 sigma) a decrease of 16 points, which is a marked decrease. At the beginning of the experiment she was 9 years and 8 months old, her mental age was 10 years and 10 months, her educational age was 8 years and 5 months, a developmental age (Sullivan Developmental Age Scale) of 11 years, and an organismic age of 9 years and 8 months. Her problem tendency score was 89, which according to the norm exceeds 89 per cent of other girls in an undesirable direction.

Figure 3 presents the growth data for G 31. Since she was chosen for her marked decrease in affectivity during the experimental interval it is interesting to note that the growth segment between interviews (A and B) contains more plateaux in development than does any other like segment in the span presented. Even height age, her most accelerated curve, is levelling off at this time. Obvious plateaux occur in carpal age, grip age, and mental age. A marked decrease is seen in developmental age during this period. G 31's problem tendency scores are seen to be consistently high, but even notwithstanding this fact they increase markedly in an undesirable direction in the period studied.

Journal recordings for G 31 likewise show a general increase in maladjustment factors during the experimental interval. During the first interview she was cooperative and friendly, speaking in short concise sentences. The psychologist, teacher, and doctor found little of interest to record at the time of the first interview, so that subjective material is mostly comprised of routine statements. In direct contrast with this lack of material at the time of the first interview, the journal records for the subsequent period (during which the marked decrease in affectivity took place) are to be found in abundance. Almost every school staff member had seen fit to record something about G 31 during this time. Items mentioned include dissatisfaction with the school, trouble with her classmates,

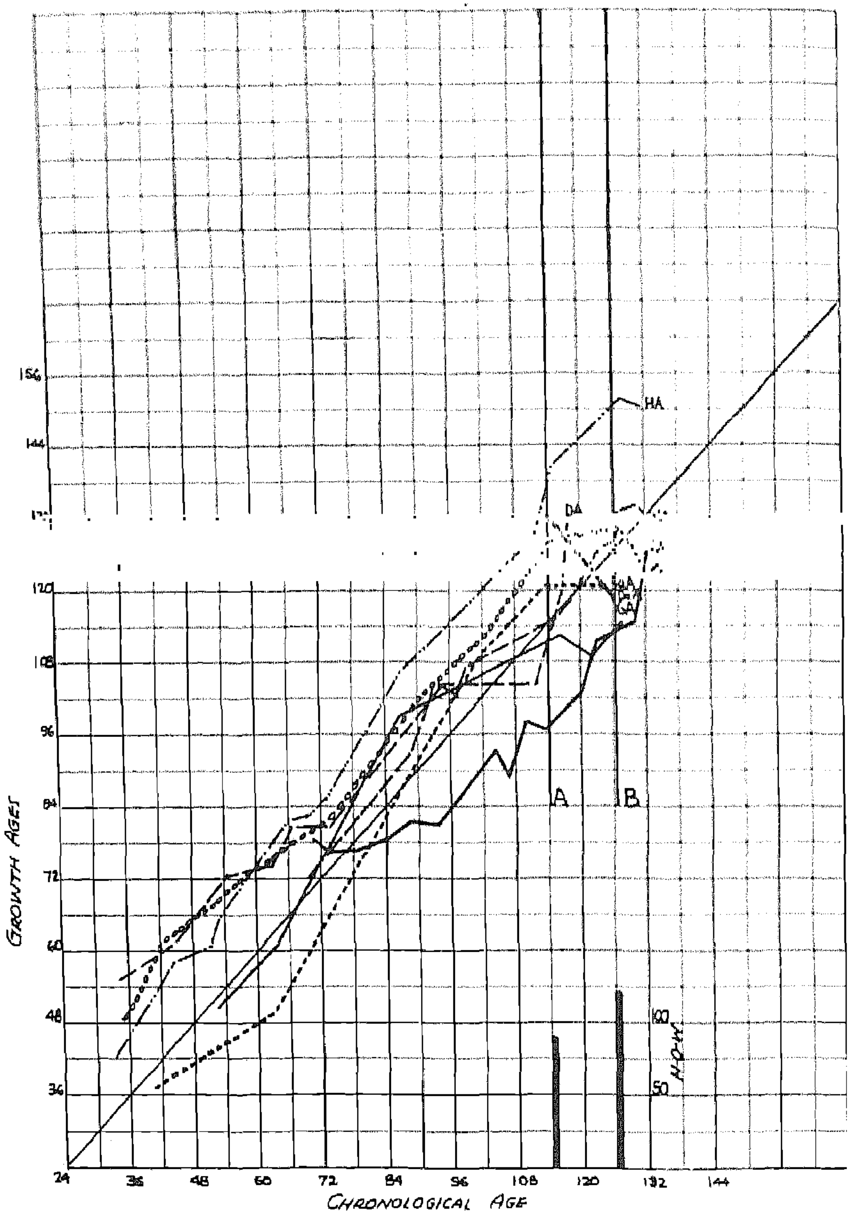

Figure 3. Growth record for girl (G 31) whose affectivity score decreased in the interval between interviews.

adolescence, carelessness, and talkativeness.

Thus, in G 31 a marked decrease in affectivity is shown to be accompanied by a general regression in physical and adjustment factors.

d. Case B 2 is a boy whose consecutive affectivity scores were 41 (-1.76 sigma) and 53 (-.23 sigma), showing a gain of twelve points, which is a marked increase. At the beginning of the experiment B 2 was 10 years and 11 months old, his mental age was 11 years, his educational age was 11 years, his developmental age was 8 years and 11 months, and his organismic age was 11 years and 7 months. His problem tendency score was 78, which is slightly above the norm for boys in an undesirable direction.

Figure 4 portrays the complete growth pattern for B 2. Since he was chosen for his marked increase in affectivity it is interesting to note that the growth segment between interviews (A and B) contains more acceleration in development than does any other like segment in the span presented.

Likewise journal material available for B 2 reflects this general improvement. At the time of the first interview notes contain references to hyperactivity, restlessness, irritability, impulsiveness, persistence, comparisons with a more superior sister, and a strained ambitious attitude toward school work. At the second interview, mention is made of his frank, open and honest attitude, general improvement concerning attitudes toward school and home, popularity, calmness, cooperativeness and spontaneity.

Thus, B 2, whose gain in affectivity is the greatest, presents a constellation of physical, mental and social traits which is characterized by a general pattern of improvement.

FINAL STATEMENT CONCERNING AFFECTIVITY AND GROWTH

In general it can be said that for the population studied overt behavior and verbalized covert feelings bear demonstrated relationships to each other. These relationships are multiple and not confined to single correlations, in that many factors (such as achievement + mentality + maturity of interests + growth rate) seem to limit each measure of the relationship measured factors to affectivity.

Changes within the growth pattern seem to play a more important role in the analysis of affectivity data than does the study of status alone. It is extremely difficult to describe what a child's affectivity level will be at a given time by simply measuring his status in other factors. However, by determining

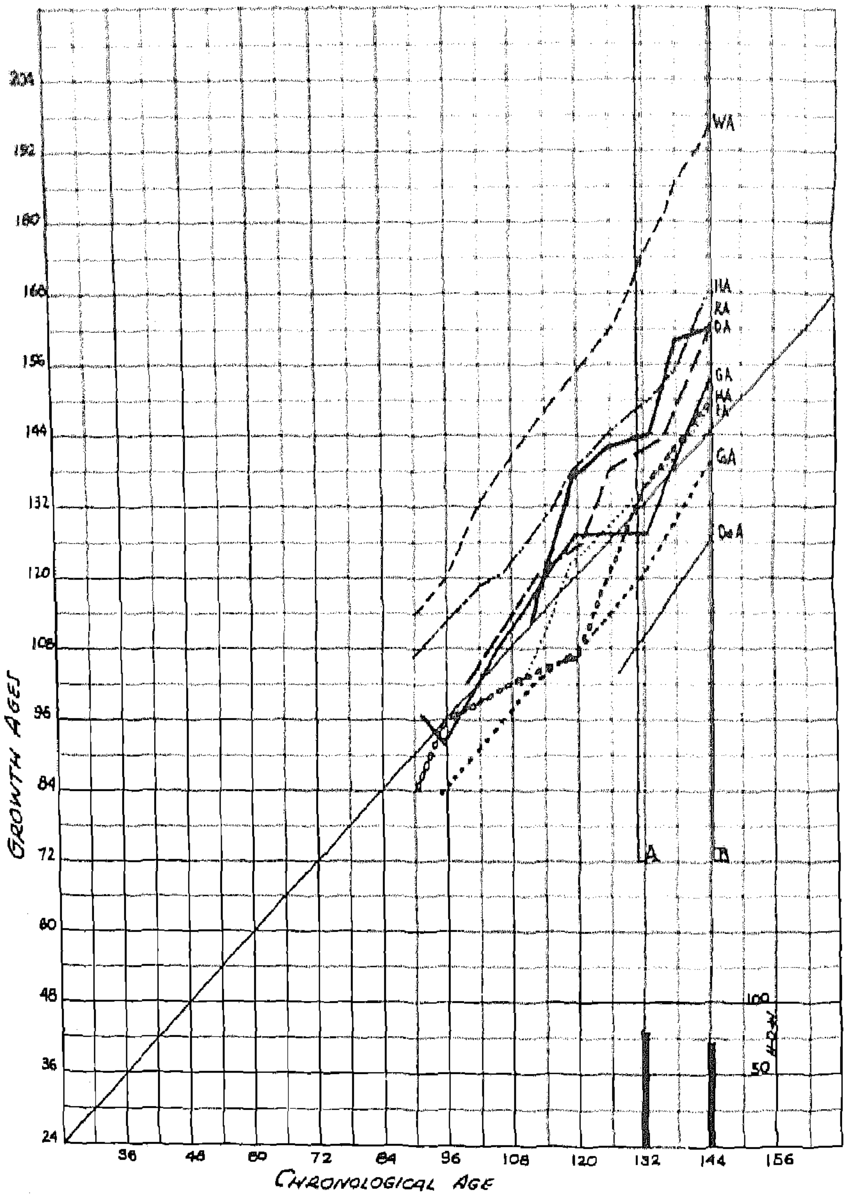

Figure 4.- Growth Record for Boy (B2) whose Affectivity Score Increased in the Interval between Interviews

Figure 4. Growth record for boy (B 2) whose affectivity score increased in the interval between interviews.

the general direction which his composite growth pattern is taking during a specified interval it is possible to fairly accurately describe the direction which his affectivity is taking during the same interval.

Affectivity seems to be a problem of group relativity as well as of status and change within growth patterns of individual children. Absolute measures such as mental age or educational age, which seem to bear very little relationship to affectivity in a group of children of varying ages will relate more closely to affectivity within a school grade where common standards and goals are shared. The impact of the entire social configuration seems to operate to color the child's affective reaction to single factors.

Within the limits of the experimental conditions, this study of the affective side of the child's development has tended to suggest further the importance of viewing the "whole child" in his field of operation and of recognizing the reciprocal effect of child and environment.[2]

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IN THE DIRECTION OF A BETTER HUMANITY

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Much earlier than we may suppose, it is possible to detect by the behavior of the infant, signs of temperament, of detrimental emotional trends as temper, timidity, negativism, and so forth, that when known give a definite basis upon which one may work understandingly. However, parents fail to give enough attention to their children, that is, understanding attention, for the simple reason that they have too little to give. They only have children and then confine their attention, so far as it goes, to satisfying physical needs. Here, the average development of parental capacity ends and with it the proper understanding of their offspring. So most children are born into neglect of which their creators, so to speak, are entirely unconscious though this unintentionally begets fresh varieties of ignorance in place of the old instead of propagating better states of life and living. Reproduction becomes, in consequence, a thing of habitual ignorance; not an escape from it in the direction of a better humanity.

Until such time as the bond of emotional gratification becomes transformed into adequate understanding, the child who is keenly affected by adverse stimuli of the home environment will show its reactions according to the most easily affected tendencies of its nature. Very often it is not taken at all into consideration that the infant is being periodically or continuously exposed to direct or indirect forms of tension and irritation which both father and mother neglect to examine, be these tensions vociferous in character or of a brooding kind.

Often, when the infant cries, it is left to itself because parents do not want to humour its mood in the oft-times erroneous impression that it has acquired the habit of so doing out of previous indulgence. It is erroneous because children, as grownups, are more or less responsive to their surroundings. A sensitive child - and it should be remembered that children are far more sensitive than grownups - will respond acutely to everything about it though it may not understand or be able to make known to the parent the nature of that by which it is being affected. As the grownup is able to detect the emotional import of a foreign tongue without knowing the specific meaning of the words he hears, so the child responds to harshness or tenderness, sympathy or indifference, confidence or undue alarm, and where there is occasion for protest, will demonstrate resentment

CHILD DEVELOPMENT, Vol. 14, No. 3 (September, 1943)

according to the intensity of its impression of the forces immediately about it. And if it is of an extremely nervous nature, it will accordingly register a violent protest.

Quarrels between parents have a definite effect upon the child's nervous system as have dissensions in general, whether between father and mother, older children, or even of close-dwelling neighbors. So, before deciding to leave a child to its own devices whenever a condition of strain is demonstrated, it would be more helpful to investigate the probable causes so that the real reason, once found, could guide us towards right adjustment which is often of tremendous scope because embracing many people and interlocked events. Then, with clearer perception of what is needed for solution, we might more thoughtfully proceed instead of always complaining about difficulties or giving vent to hysterical outbursts of which abnormalities there is far greater cause for alarm than that provoked by a child's unalloyed expressions, so often ruined by ridicule, rebuke, or over-anxiety for professional guidance-prescriptions lest he be in retard of the rest of humanity.

So far as the rearing of the infant is concerned, it is the fixed idea of normality that constitutes a most common preconceived assumption. What is rather needed is a first-hand individual study, not of majority behavior in contrast to minority behavior, but focussed upon the attempt to know this child without stereotyped comparisons of behavior correspondences as leads. Comparisons, whether psychological or physiological, should be used only in time of emergency, that is, when a most difficult problem arises, one demanding immediate attention whereupon the specialist should be consulted.

Thus, were the child, according to knowledge based upon developmental tables, to fail to show usual aptitude in walking, speaking, seeing, and so forth, medical consultation should be sought and, should it then be found organically sound, there is no need to worry that the child will not later catch up with any belatedness - unless parents, in their exaggerated concern, shock the child into developing nervous complications which can lead to organic impediments.

Of course there are innumerable instances where doctors fail to discover the physiological correlates of a disturbance manifested in behavior but such problems could be greatly reduced in number were the corrective of closer understanding applied with greater interest to infancy.

If we want to succeed in eliciting the best that is possible in a child, we must not do so with preconceived ideas, in particular, of creating for him a destiny which, we feel, will redound to our credit. If we do so, we shall never understand the child and thereby bring unnecessary disappointment to ourselves because in building such dreams about him, we are merely occupied with egotistic visionings so that instead of helping the life which has come into our charge, we thwart the finest of which he might become capable had he received the utmost of our understanding instead of being made the willy-nilly hero of our wilful dreams which, at least in the beginning, are not his. It were better for children were parents not to give their dreams of grandeur blind vent but, through the effort leading to awakenment and awareness, sought for the object of their love, the child, to seek the closest acquaintance with it and, through that, gain understanding of its tendencies. It is these which are the parent's most dependable guide to the right treatment to be given. For if the child is to grow well, not only in body but in mind, he must be given the opportunity to eventually develop by himself those tendencies which will be most useful in mastering all the weakening inclinations which even *my* child possesses although I have invested his fate with that of the imaginary leader of the country of my dreams in which he will always rule. Try, instead, to see him in a realistic world, in a world in which he is to learn a great lesson and where everything tries to reveal some truth; where there is, as yet, suffering and disease, the selfishnesses of sex, jealousy, and hatred; where there is also kindliness, profundity of love in which not merely the personal but all things have an interest, a meaning, and a purpose to be regarded and reflected upon without fear or discrimination because to the living it is a world in which nothing is dead. So that if the child is to gain by everything it does and will do and of which social or economic station is not the criterion of success, it must be brought up in a living world.

There is much controversy as to the criterion of success. It is the expression and action of the mind which makes growth the highest aim of living. There is nothing bombastic about this mind for in all it does it is searching, loving, caring, ever striving to free others from darkness and misery which, from its own experience, it knows is the most worthwhile of accomplishments. It also knows that gracious living is obtained by what we are; never by what we own.

Parents should never be too anxious, too impatient for results concerning the aptitudes of their children. Clever children are seldom the most intelligent and the so-called backward child will be found not wanting even if he does not display an acceleration equal to what is now considered normal. The genuine teacher seeks to know the child through observation and reflection upon his observation. How else could he teach it? And to try to teach someone of whom there is no knowledge can only defer real teaching.

This applies to the parents who have given birth to the infant and who become its first guides. If they are not teachers of understanding but only crude guides they will, though unwittingly, guide their child wrongly and, it is most likely, develop in him the poorest type of mind which can but lead to the complications of an ordinary existence where, despite material hoardings, only tuitiveless care companions.

With observation which is not through books but relies upon first-hand evidence and sufficiently sensitive reflection upon such evidence, we will find that the consciousness of the infant is not limited to the point where it can only express through physical signs what it will later express orally, through locomotion, and other communicatory means. Which is to say, the infant, as the adult, has a mental and an emotional world; the difference being that the infant has yet to learn how to translate its workings into terms understandable by the poorly observant who include those who have become too complex, too complicated to understand a being which is not just inarticulate and stupid but vibrant with life. Only by watching it as it unfolds may the mental life of this being be intelligently guided. But there is the impression that at the early stage with which we are here concerned, there is no life with which to work but only involuntary reflex adjustment of greater or lesser intricacy. However, this impression only carries weight because of the fact that the subjective operations of the infant's mind lie withdrawn from our view. Until our restricted consciousness broadens, the workings of the other must remain withdrawn to that which is worlds apart.

We are equally in error if we suppose that the mind is fully grown in the infant and that all it needs to do is to learn how to express its wants in word and deed. But it does have the definite capacity to think and feel, which it uses in its own world of free movement although seeing no reason for expressing thought and feeling as do we. So that while it has no crystallized ideas for survival, this does not mean that it is devoid of the instinct to prolong its existence. And since what we so often confuse with reasoning on our parts is but the expression of instinct, we may say that the infant does not "reason" that in order to continue living it must acquire additional psychological faculties that will enable it to fulfil this to it as yet nebulous purpose.

As struggle is paramount in the life of the adult, so we find manifestations of struggle in the infant as its mind becomes aware of its mental and biological responsibilities. At first, there is little awareness of its surroundings, it being oblivious in consciousness to the body which becomes the earliest environment of the human mind and from which follows awareness of the environments wherein the body finds itself.

The infant's earliest exploratory movements are then performed without those motivations which operate in the complicated consciousness of the adult, for what it does, we shall find, is done as play. That is, its consciousness has not the calculated significance of the adult in that present satisfactions are sought for their own sake and for no ulterior motive to be satisfied at a future date. Hence, it is natural for it to grasp at an object that is being taken away but only because the free play of what it is doing is thereby artificially interrupted. However, it does not see this at first as losing a property but rather as an outside interference disrupting the rhythm in which it finds satisfaction. While it will lay down an object when interest in it momentarily ceases, when forcibly taken away, it becomes conscious of a break in a train of events of interest to its consciousness just as if it were to take a deep breath and have that interrupted before completion which, it is obvious, would be in the nature of a shock.

When we teach the child the possession of things as, for instance, by giving it a property while saying: "This is your ring. You mustn't lose it. Remember now, don't lose it or you'll be spanked," its ego will rapidly grow in the direction of possessorship which will apply not only to a ring or to toys, but to everything in its life environment of the future. The use of toys and trinkets helps then to induce an early sense of exclusive ownership - an egotistic emphasis upon mine and thine of catastrophic consequence for its future.

To avert this, educational means should take the place of toys which are merely means for diversion so that the child will least annoy by being kept busy with anything. As yet, it is still considered a nuisance which is why toys, including "educational" toys as they are called, are so popular with the average parent who resorts to them as the most effortless solution to its demands for attention. Doubtlessly, the erroneous impression that they are contributing to the intelligence of the child, besides preparing for future academic adjustment, also enters to lend excuse to their excessive popularity. But while it may be that blocks will acquaint the child with the alphabet, arrange them as he may, they will never teach him the fundamentals of considered behavior.

Even if he has not learned the alphabet at home, it will not be to his detriment since he may master it at any time easily enough. But he will spend the rest of his life never knowing the satisfactions of thoughtfulness, the value of which his parents have helped him to forego learning.

The necessity for toys may be obviated by helping the child to attain skill in everything he can do about the house at the earliest possible occasion. Here, much can be done which is instructive, practical, and useful and which should not be considered by parents as being beneath the child's dignity. The purpose of such skill is above all educational since it is designed to make the child self-sufficient in every possible respect; not only as regards the outward skill but particularly in connection with the degree of voluntary effort put forth.

Then, there is the out-of-doors, not only of fields and woods, but of the yard, the street, and the town, each of which offers an abundance of opportunities to further the natural appreciation for all things. Appreciation is care and heart-felt respect; not cold regard accompanied by indifference, rowdiness, or fear which, if once instilled in the child, are transcended with difficulty, if at all, in the absence of the advantages given by a fine mind.

There is also the family relationship of the home, the approach to which may produce either sincere communion or subservience to artificial amenities wherein disregard takes the form of voiceless or fretful quarrelings.

Not by playing with things but by becoming part of them do we arrive at communion which is no other than the realization of kinship that finds expression in the sharing of one's self. But recourse to the bit of trumpery does not help to develop the mind, the character, the sensibility of heart of the child, but only the inclination to look upon everything as a toy and the tendency to treat it as such not only as child but as grownup. If, therefore, we do not give it any toys during the short period of infancy, that is, prior to walking, it will not die of ennui since it has a play of mind and lives in a world of its own where physical action, other than that arising out of its bodily functionings, is not necessary. This being so, it can never lose if it does not receive those toys that are now deemed so indispensable to its maturing.

There is enough to develop its mental, sensory, and motor apparatus in the exercise of its necessary functions. Thus, in feeding it grows in the use of the hand, employing fingers and thumb wherewith to grasp the breast of its mother, learning gradually to use them less and less clumsily. Following the period of breast feeding, the growth of its behavior will naturally continue in the actions of bottle feeding, acts of elimination, sitting, standing, crawling, walking, and so forth. Through these, it improves in the surer use of its hands, control over its musculature, the more accurate gauging of visual stimuli, and so on.

When the child is unnaturally restless, instead of turning to toys as an escape, let the mother sing to it or play some soothing music provided she does not confuse restful harmonies with cacophonic "melodies" of the moment. Then, she can carry it in her arms or play with it on some spacious, soft surface but not teasing it for this is very different from play, the one merely causing excitement, a possible seed of later hysteria; the other, guided by understanding, producing a soothing, tender relation between mother and child which is truly educative.

A spanking does not mean a flogging nor, out of resentment, to give the child a whacking blow. It is rather a touching which has the nature of a thinking contact (because it has a thinking content), and is therefore never motivated by an emotional outburst on the part of the mother who knows that her child, being a sensitive instrument, will register the unseen quality of any contact. It is better not to touch the child at all in way of punishment if parents lack the understanding necessarily going with such treatment which, at best, is actually a form of guidance. Furthermore, it is also better not to teach it anything than to teach it wrongly for then it will always be difficult for it to undo the effects of the first vivid impressions so as to start afresh. Whereas, if it has been taught nothing, it will only have to start and will certainly not be the loser by having had to wait a little longer.

The progress of the child will therefore be much more thorough if his education proceeds without hurry, for what real benefit can there be in hustling him off into learning things before he is given the opportunity to cultivate some kinship with his mental and physical self? Let him first behold his surroundings through feeling, a natural condition with the child which, when it is not disrupted by the anxiety of impatient parents who look upon obvious signs of hability (habit-ability) as sure demonstrations of intelligence, grows into thinking which helps him to become his own inward and outward observer. He will then be able to consult himself with all sincerity of heart and mind in everything he does and so learn to enrich his life with creative action instead of idling it away in the search for a visionary happiness and security contained in the absurd promises held out by educators who prescribe everything but encourage no natural growth through their allegiance to dogmatic tenets and customs. In this way, the error of learning by copying continues to hold an unrelinquishing grip upon the mind which is trained to know things but not to know itself and must therefore remain unresponsive to its creatively thinking self.

What is sadly lacking in the educational care of the child from early upbringing to later public or private instruction is the realization that if he is to grow up genuinely strong, his mind must become self-governing. If it is to think independently of old truths - which is not to disregard them - we cannot heap upon it artificial means of training which may well be regarded as no more than figments of a commercial genius that has invented innumerable tricks to be used in conventional instruction. These are but fly-catchers from the self-diverting child's toy to the chilling prescriptions of instruction and allied testing.

First help the child's mind to sing in unity; then you may safely build upon this unity, but not by beginning to indulge it in toys. That, you may be sure, will not increase his strength but add power to the seed of ego in him which will all too soon make itself felt and heard. He will thank you with understanding later on when you have succeeded in helping him to become a thoughtful caretaker of things which he cannot become when you guide him, even though inadvertently, into habits of meditating upon possession that eventually comes to roost, with its attending incubuses of envy, hate, and greed, upon the finite sense of mine which, more than often, has an uncanny tendency to include what belongs to others.

This does not mean that later the child may not enjoy the use of bicycle, roller skates, and other recreative contrivances, provided they are used for recreation and without stress upon the physical at the expense of the intellect. Although bodily care should not be neglected in the interest of the mind, it should be seriously remembered that a misshapen mind is far more tragic than a misshapen body.

The girl, too, depending upon the natural processes of maturation which make it possible for her "to do for herself," may also have the use of doll, carriage and other objects of interest so long as they are employed for practical purposes, that is, as a preliminary to actual child care which, it is certain, will do her no harm to know. Nor is there any reason why a boy child - the future intelligent father - should be denied the benefit of some knowledge, similarly derived, concerning the needs of the baby. This is not intended to encourage thoughtless breeding but, on the contrary, to take away the savage strain of thoughtlessness which too often predominates in later marital relationships as well as in the unnatural coarseness or morbid shame so characteristic of average adolescence, these conditions definitely confirming one of the gross carelessnesses with which the child's mind has been tended.

There is no time set aside in schools, of whatever level, for instructors to initiate tomorrow's parents into knowledge which would help them to transcend jocularity as a cover for shamed embarrassment, because an informing knowledge of sex with all its wholesome functions - and this must go beyond the limits of the physiological structures involved to include the psychological elements - has always been left hidden, with the result that later this ignorance produces not only an unnatural shame but an attitude of blind possessorship toward the object of desire.

There are men and women, not professional prostitutes, who walk stealthily along the street, fearful of being detected, indulging and then running away. Had they been given the benefit of healthy knowledge, they would understand the nature of their sexual desires and would no longer be compelled to act as thieves.

If sex were elevated to the level where it is no longer falsely hidden, there would be no occasion for being morbid about it and, not only that, there would eventually be the cessation of the irrational desire for it created by the fact that it is kept an irrationally covert subject. The secrecy of sex is one of the crimes of modern education. It makes for boldness of sex, for the deteriorations of promiscuity and innumerable forms of obsessions. None of these, although they may not take overt forms of expression, is really harmless. They all interfere, to a degree, with man's sane mental and physical behavior.

In building an edifice, the superstructure cannot be erected before the foundation has been properly laid. The site where the edifice is to stand presents the potential foundation so that it is here that the expert engineer surveys the ground to find out what is needed for the task. This done, the actual preparation of the foundation is performed step by step until it is ready to receive the superstructure. All this is done by the good builder with great care long before it stands ready to weather the tests of the elements.

In rearing the child at home and, later, in teaching, the foundation of mind is taken for granted. We do not begin by preparing to blend its functions into one harmonious unity of reflective concentration. We say: "The mind is there. Now let us see: we shall soon know what kind of a mind it is that we're dealing with by how efficiently it carries the things we place upon it." In this way, whether we be parents or educators, we erect our edifice upon an ill-considered foundation, judging the quality of mind by its storage space and not by deep-seated potentialities of reason which elude our interest. Working as we do under the misapprehension that the methods and materials used in building the structure will simultaneously prepare the solid foundation, we build precariously.

To erect a genuinely serviceable mind, we must not, out of false economy, fail to prepare as serviceable a foundation;

otherwise everything will surely not stand the tests with which it is going to be tried.

Though mind in itself is harmonious, the instruments of mind which are its receptors cannot conserve what is received if this be not studied in calm without which clear thinking becomes infinitesimal in scope and leads to dullness of thinking. The dull mind is also the fidgety mind which, like a blind hare upon a leash, jumps hither and thither while getting all tangled up in it.

Truth and the truth of anything is never obscure for it is rather the obscureness of our minds which obscures comprehension. As we learn to practice reflection, our obscureness is lessened, though not all at once, and then what we think is thought about with increased plainness and leads to understanding action which is the inevitable fulfilment of thought. Whereupon that which went unperceived, made perceptible through experience, becomes the credible real.

Only fatuous minds give way to worship of precedents, reputation, and place. Whatever it is that they learn, they labor to achieve without thirst for learning. Stressing as they do quantitative knowledge and mechanical skills in the interests of personal ambition, they never cultivate understanding, being too busy forging tools of knowledge which they misapply, and so make men unequal through contention. So more knowledge in them makes only for more sorrow. But while there is no real advantage in brooding over our remissness here, one should never underestimate their mounting strength over us through lack of reflection upon what they do to our lives.

Were there an education of thought, that is, an education furthering the increase of qualitative thinking not in addition to but providing the foundation for any superimposed knowledge of facts, social programs such as prohibiting now one mode of behavior, now educating another, would become entirely superfluous. It stands to reason that minds which have not been trained to become copying apparatuses will, by themselves, prevent undesirable conditions from arising or seek a solution to existing problems for themselves and for humankind. This would mean that desirable conditions would not only be established but be prevented from undergoing degradation though not through habit or tradition which are inimical to the creatively exploring consciousness. As it is now, the majority never heed warnings until conditions make it impossible for them to continue their rote existences, and then only with a purely traditional self-concern.

The axiom upon which education should rest is that of benefitting the child by helping him to identify the workings of his mind with himself through introspection and without so many verbalisms on the part of parent or instructor in order that the actions of the child may gradually cease to be controlled by egocentric vagaries through an ever-widening scope of self-insight. When the mind gains a certain cognizance of itself through personal though not narrowly self-centered interestedness, the more consciously it functions and the more directly conscious the mind is of what it does, the more is its scope of discernment increased in action.

As the mind begins to know itself and hence gains in real strength, it is able to diminish the craving for pleasure while pain, its counterpart, simultaneously atrophies, this marking the beginning of freedom from the perpetuation of these two contrasting sensations of which it is not possible to have the choice of one without the succeeding appearance of the other. The average notion of pleasure is that it is an enjoyment unalloyed with tension, aggravation, or care, although this quality of pleasure may be identified with selfish satisfaction which lasts only so long as that which produces the pleasure endures - which is never long enough.

It is then exclusively for self-indulgent ends that happiness is sought by the ordinary mind though this it can never, so long as it remains ordinary, admit to itself or to another. For example, I may think that I seek happiness for the sake of another person I love, whereas in reality I do so mainly because I seek it for myself, for once that person leaves me to be with another, my intense feelings of devotion undergo a definite change. Upon reflection, it becomes evident that I sought to give happiness to the other only that my own seeking for happiness might be gratified and that whatever I did for the other was mainly for myself.

But there is a happiness that is not related to self-indulgence, being rather thwarted by any weakness of mind, and whose quality is that it seeks to enrich others by helping them to grow in understanding, to make the mind and heart forever young through the ever-increasing inflow of energy, to widen the banks of the riverbed of that energy which is themselves that they may share of themselves for the good of all who would quench their thirst upon that universal flood of which there can be no exclusive possession.

It is understood that most children are unaccustomed to an education having this aim which is precisely why the guidance of teachers who will faithfully keep the child from following channels of imitative conduct is of inestimable importance. This they do by assisting him to reflect upon his own behavior instead of rushing him to quick conclusions in order to prove that they have accomplished something when all they have done is to further bend the child's leanings to the side of imitative acquiescence.

If the child does not grow closer to himself, he will never know his nature intimately (for this learning will be too intricate for him to approach, far less to understand), and at last wear himself out through one diversion or another to escape disturbance occasioned by this lack of understanding from which throughout life he has been systematically estranged.

While no one will deny the sincerity of the interest which continues to be voiced in progressive living and its reflection in education, it should also be admitted that though many changes have taken place in the curriculum and methods of presentation of subject matter, no direct attempt has been made to break down the error existing in the bookish, routine-preparation of the instructor which causes him to rely upon words, upon the latest, most up-to-date literature which, he prides himself, is his most dependable source for the acquisition of further information.

But this sort of training gives the average instructor of any grade, including the kindergarten, little understanding of teaching though he may amass a great quantity of cold knowledge presented by him in the same conventional spirit to his pupils, although this is far from the giving of himself which a teacher must be able to do if he is to earn the close confidence and trust of those in his care and without which teaching deteriorates to a chore.

Is it not for want of personal development that he can only give of his work and not of himself and which is not so much the fault of those who become, technically speaking, teachers as it is that of the established standards upheld by all those who are directly and actively connected with the organization of education and who oversee the pattern of teaching? So that were the standards to find improvement, were they not only to put stress upon technical achievements on the part of the teacher-candidate, not everyone with the mere ambition to become a certificated instructor would find his place in the classroom and especially not in the kindergarten, that department of the school where only the finest minds should be at work preparing the newly launched human vessels to pilot themselves from the harbor out to sea.

Progressive living begins with the growth of mind and that not later than at the beginning of formal schooling which should continue what the progressive parent has accomplished instead of undoing what has been done. In the event that the mind has not already received such help from the parent - which happens rarely to be the case - the earliest time to give the mind this start is then the school. But if we begin with imitative methods which give but the habit of thinking and doing as the physical eye sees with all its attending limitations so far as meaning is concerned, the human vessel will rot in the harbor.

To avoid such wastage of human material, the teacher[1] who would supervise the emancipation of mind in the kindergarten and upwards must have at least these two essential qualities: impersonal human understanding and profound feeling which is not to be confused with romantic sentimentalism. He cannot therefore be merely a product of perfunctory learning with degrees attesting to professional qualifications in the pursuit of which these qualities have been, as is so often the case, obliterated. All qualifications are dependent upon the development of the qualities present in a person's nature and are therefore derivatory. So that it becomes evident that the two essentials are qualities, not qualifications which are now erroneously placed above all fundamental values.

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[1] *Nordau, Leon: To Know the Teacher. Harvard Educational Review, May, 1943.*

GAIN IN WEIGHT DURING PREGNANCY[1]

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Since the initial study by Gassner (3) in 1862 of weight gain during pregnancy, a voluminous literature has accumulated on the subject. Recognition, during the last quarter century, that excessive gain is frequently the forerunner and concomitant of pre-eclamptic or eclamptic toxemia has further stimulated recent investigations.

It is not the purpose of this article to review the literature, which has been adequately done, but simply to report briefly our experience with 484 private patients, who were carefully followed by the three physicians listed above, and their results punch-carded, analyzed, and arranged by the first author.

All the patients were white and had single foetuses born alive within thirty days of the expected date of confinement, as calculated from the menses. All the women were well situated economically. Each was weighed every three weeks during the first thirty-two weeks of pregnancy and every two weeks or oftener, in the last eight weeks. There was an average of ten weighings per patient.

Individual advice was given about the proper diet during pregnancy at the time of the initial visit. Women whose weights were normal for their heights were cautioned to eat very moderately of carbohydrates and fats; those who were underweight were advised to eat normally of such foodstuffs; and those overweight were urged to avoid the fattening substances.

The series of 484 patients had an unusual preponderance of primiparas (62 per cent, in contrast to 39 per cent of the white women delivering live births in the United States during 1938) and the average age was slightly greater than that for all

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[1] *This paper is part of a more extensive study made with the cooperation of the Child Hygiene Studies Section of the Division of Public Health Methods, National Institute of Health, U. S. Public Health Service.*

[2] *The authors wish to extend grateful acknowledgment to Dr. Jacob Yerushalmy, of the U. S. Public Health Service, for invaluable assistance in the analysis of the material and presentation of this report.*

CHILD DEVELOPMENT, Vol. 14, No. 3 (September, 1943)

TABLE 1

PERCENTAGE DISTRIBUTION OF MOTHERS BY AGE AND NUMBER OF CHILD; WHITE LIVEBIRTHS IN THE UNITED STATES, 1938, AND IN THE PRESENT STUDY

Age of mother	Number of child						
	Total		First		Second or over		Not reported*
	U.S., 1938	Present Study	U.S., 1938	Present Study	U.S., 1938	Present Study	U.S., 1938
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Under 15	**	0.0	0.2	0.0	**	0.0	0.0
15 - 19	11.7	1.3	24.4	2.0	3.7	0.0	0.3
20 - 24	31.7	22.5	42.0	29.4	25.2	11.2	31.1
25 - 29	27.5	45.3	22.9	46.3	30.4	43.6	33.0
30 - 34	17.0	22.1	8.1	16.0	22.6	32.4	21.2
35 - 39	8.9	8.6	2.1	6.3	13.2	12.3	10.4
40 - 44	2.9	0.2	0.3	0.0	4.5	0.5	3.8
45 and over	0.3	0.0	**	0.0	0.4	0.0	0.2
Number of cases†	1,935,534	479	748.798	300	1,184,853	179	1,883
Average age	27.0	28.2	23.6	27.3	29.1	29.9	--

* Number of child was reported for all cases in present study.

** Less than .1 per cent.

† The cases, for which age of mother was not reported, have been excluded

childbearing women of the United States (28.2 years vs. 27.0 years). (Table 1).

RESULTS

The average weight gain from the usual weight of the 484 cases during each lunar month is depicted in Figure 1 and Table 2. During the first trimester, the gain was negligible but beginning with the second trimester, the cumulative gain could almost be described by a straight line. In the month prior to delivery, a slowing up in the rate of gain was noted. The total average weight gain was 24.3 pounds, which agrees almost exactly with the reports by other American authors,[3] the chief exception being the study of Stander and Pastore (9) who found a gain of 30.7 pounds from the sixth week of gestation.

FIGURE 1— AVERAGE CHANGE IN WEIGHT DURING PREGNANCY MEASURED FROM THE "USUAL" WEIGHT OF THE MOTHER

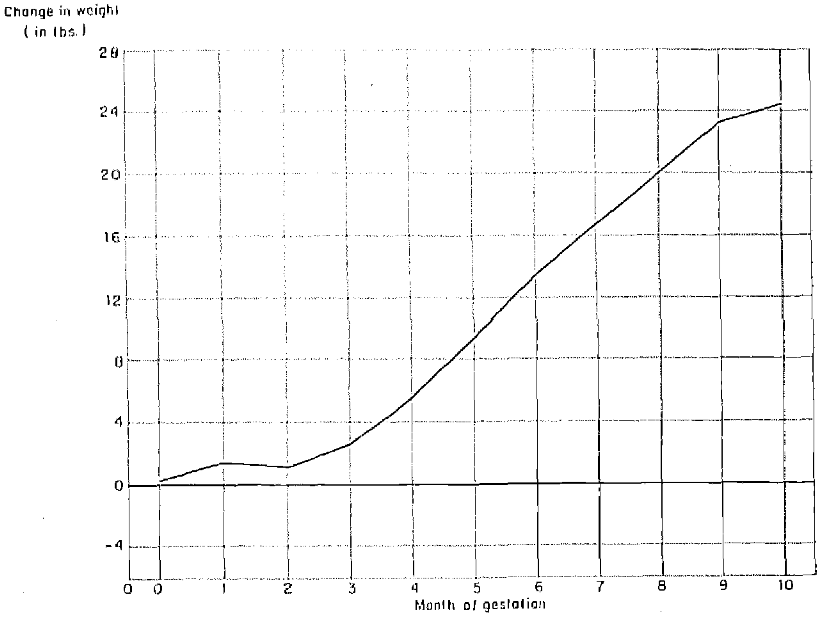

Figure 1

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[3] *Cummings (2) reported a total weight gain of 24.08 pounds; Bray (1), 23.7 pounds; Randall (6), 23.2 pounds; and Granger (4), 20-25 pounds.*

TABLE 2

AVERAGE GAIN IN WEIGHT* DURING PREGNANCY

Month of gestation (in lunar months)	Cumulative average weight gain (in pounds)	Number of cases
0 - 1	0.2	4
1 - 2	1.4	90
2 - 3	1.1	266
3 - 4	2.5	335
4 - 5	5.5	373
5 - 6	9.4	410
6 - 7	13.4	430
7 - 8	16.6	450
8 - 9	20.0	469
9 - 10	23.2	452
10 to delivery	24.3	179

* Weight gain was measured from the "usual weight" of the mother.

The weight used for the 484 cases from which to compute total weight gain, was the patient's usual non-pregnant weight, as stated by her. To rule out a possible inaccuracy from relying on the stated weight, in 299 cases who were weighed an average of twelve times, we used the weight determined at the initial office visit. All of these 299 women had reported before the twelfth week of gestation. Their weight curve is depicted in Figure 2. When compared to Figure 1, it can be seen that the two curves are almost duplicates. The average total weight gain calculated from these two different bases are within 0.1 pound of each other.

In determining what a desirable weight gain during pregnancy should be, it seemed logical to examine the weight curve in the postpartum period.[4] (Figure 2.) Six weeks after delivery, there was still an average excess of 3.1 pounds over the third month weight. By the eighth week postpartum, the decline in weight gain had leveled off and begun to rise slightly. Although 28 per cent had fallen below their third month weight by this time, 72

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[4] *A postpartum visit, six or more weeks after delivery, was reported for only 246 cases. Analysis was based on only one postpartum visit per patient.*

FIGURE 2.- AVERAGE CHANGE IN WEIGHT MEASURED FROM THE THIRD-MONTH WEIGHT OF THE MOTHER ; PRENATAL AND POSTPARTUM PERIODS

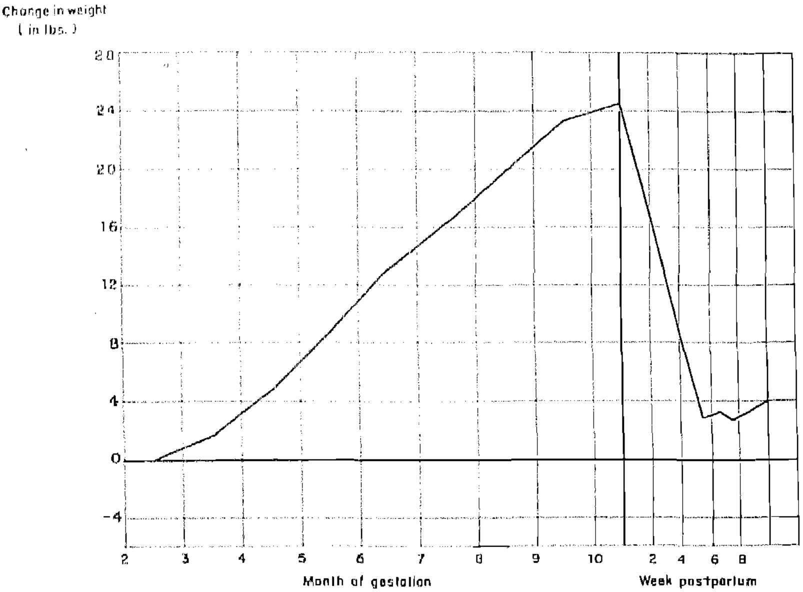

Figure 2

per cent were still above that weight. Only 24 per cent of the women were within two pounds of their third month weight at the time of the postpartum visit. It is possible that this average gain was slightly higher than desirable.

When we separated the primiparas from the multiparas and charted each group separately we found extraordinarily similar curves.[5] The two curves approximated each other throughout the whole period, with the primiparas gaining slightly more in the last few weeks before delivery. (Figure 3 and Table 3.)

The most significant finding in this study was the apparent control of weight gain by simple verbal directions, for the stout women gained least (non-pregnant weight 140 pounds and over),

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[5] *In agreement with our findings are the studies of Siddall and Mack (7) and McIlroy and Rodway. Both concluded that the difference is slight, if any. No difference was reported by Slemons and Fagan (8), Stander and Pastore (9), and Bray (1).*

TABLE 3

AVERAGE CHANGE IN WEIGHT* DURING THE PRENATAL AND POSTPARTUM PERIODS, FOR ALL CASES AND FOR PRIMIPARAE AND FOR MULTIPARAE

Prenatal period

Month of gestation (in lunar months)	Average Monthly weight gain (in pounds)			Cumulative average weight gain (in pounds)			Number of cases		
	Total	Primi-parae	Multi-parae	Total	Primi-parae	Multi-parae	Total	Primi-parae	Multi-parae
3 - 4	1.6	1.6	1.7	1.6	1.6	1.7	265	181	84
4 - 5	3.1	3.1	3.0	4.7	4.7	4.7	273	183	90
5 - 6	4.0	4.1	3.9	8.7	8.8	8.6	277	184	93
6 - 7	4.4	4.4	4.3	13.1	13.2	12.9	282	188	94
7 - 8	3.1	3.2	2.9	16.2	16.4	15.8	286	191	95
8 - 9	3.5	3.5	3.5	19.7	19.9	19.3	294	196	98
9 - 10	3.5	3.5	3.4	23.2	23.4	22.7	273	182	91
10 to delivery	1.2	1.7	0.1	24.4	25.1	22.8	104	73	31

Postpartum period

Weeks post-partum	Average weight change (in pounds)			Number of cases		
	Total	Primi-parae	Multi-parae	Total	Primi-parae	Multi-parae
5 - 6	2.9	3.1	2.4	45	31	14
6 - 7	3.1	3.0	3.5	121	78	43
7 - 8	2.6	1.7	4.7	44	31	13
8 and over	4.0	3.0	5.3	36	20	16

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* Weight change was measured from the third month weight of the mother.

FIGURE 3.–AVERAGE CHANGE IN WEIGHT MEASURED FROM THE THIRD-MONTH WEIGHT OF THE MOTHER, FOR PRIMIPARAE AND MULTIPARAE; PRENATAL AND POSTPARTUM PERIODS

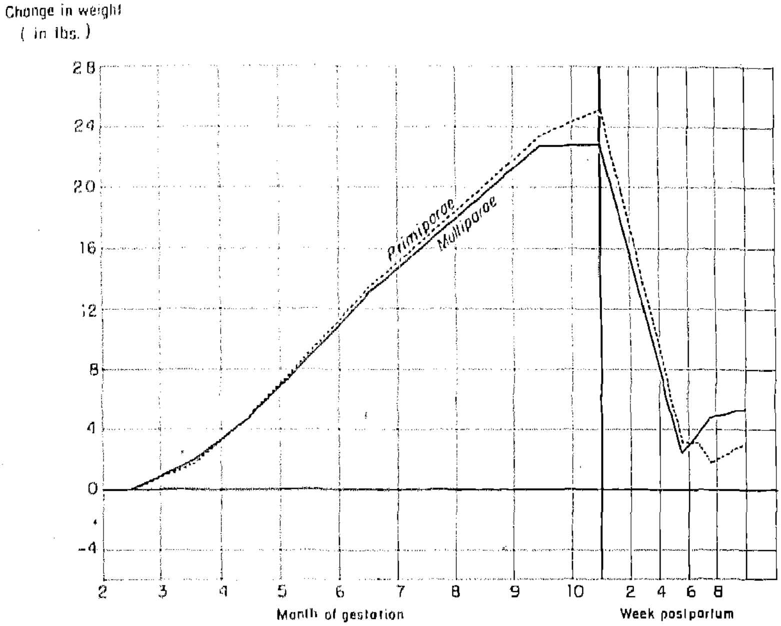

Figure 3

the thin (non-pregnant weight less than 110 pounds) gained most, and those normally built (110-139 pounds) gained an intermediate amount.[6] The light women also showed a steeper rate of increase, which continued even through the month preceding delivery. During the few weeks prior to the termination of their pregnancy the heavy women averaged a slight loss in weight. Although the curves for light and medium women almost coincided throughout the pregnancy period, the former overtook by the sixth month, the slight lead in weight gain established by the heavier women. From the sixth month until delivery, the average weight gain of the medium-weight women fell between that of the lighter and heavier women. At delivery, the light group had gained 27.0 pounds, on the average, the heavy group 21.0 pounds,

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[6] *Only the study by McIlroy and Rodway (5) concurred in this conclusion.*

TABLE 4

AVERAGE CHANGE IN WEIGHT* DURING THE PRENATAL AND POSTPARTUM PERIODS, FOR THREE WEIGHT GROUPS

Month of gestation (in lunar months)	Prenatal period					
	Third month weight (in pounds)					
	Under 110		110-139		140 and over	
	Cumulative average weight gain (in pounds)	Number of cases	Cumulative average weight gain (in pounds)	Number of cases	Cumulative average weight gain (in pounds)	Number of cases
3 - 4	1.7	42	1.7	180	1.1	43
4 - 5	4.2	43	5.0	185	3.9	45
5 - 6	9.0	45	9.0	185	7.4	47
6 - 7	13.4	46	13.3	190	11.7	46
7 - 8	16.7	47	16.5	191	14.6	48
8 - 9	20.6	47	20.0	198	17.8	49
9 - 10	23.9	44	23.4	184	21.5	45
10 to delivery	27.0	20	24.5	68	21.0	16

Weeks post-partum	Postpartum period					
	Third month weight (in pounds)					
	Under 110		110-139		140 and over	
	Average weight change (in pounds)	Number of cases	Average weight change (in pounds)	Number of cases	Average weight change (in pounds)	Number of cases
5 - 6	8.8	6	2.9	32	-2.1	7
6 - 7	6.0	17	3.4	79	0.2	25
7 - 8	5.4	7	3.0	33	-5.0	4
8 and over	4.9	8	3.9	25	-1.5	3

* Weight change was measured from the third month weight of the mother.

FIGURE 4.– AVERAGE CHANGE IN WEIGHT MEASURED FROM THE THIRD-MONTH WEIGHT OF THE MOTHER, FOR THREE WEIGHT GROUPS; PRENATAL AND POSTPARTUM PERIODS

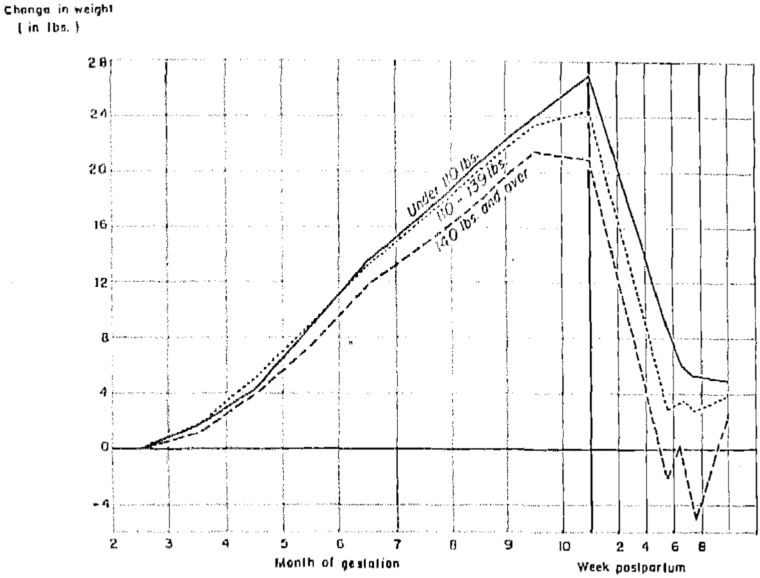

Figure 4

and the medium-weight group 24.5 pounds.[7] (See Figure 4 and Table 4.)

At the completion of the sixth postpartum week, the groups in inverse proportion to their non-pregnant weights, showed average gains of 6.0, 3.4, and 0.2 pounds over their initial weight taken during the third month of pregnancy.

The more a woman gained during pregnancy, the greater was the difference between her postpartum weight and her third month weight. This relationship was shown above for three weight groups. Table 5 was constructed to measure this association when weight is held relatively constant. The medium-weight group, 100-139 pounds, was used. The table showed, for example, in the sixth week postpartum, that for a total gain of less than 20 pounds, 20 up to 25 pounds, and 25 pounds and over, the average differences between the postpartum weight and the third month weight were, respectively, 1.36, 4.16, and 7.08

[7] *When women under 100 pounds were compared with women 160 pounds and over, the contrast in weight gain was even greater.*

TABLE 5

AVERAGE CHANGE IN WEIGHT* IN THE POSTPARTUM PERIOD, ACCORDING TO TOTAL WEIGHT GAIN FROM THE THIRD MONTH TO DELIVERY**, FOR THE WEIGHT GROUP, 100-139 POUNDS

Weeks post-partum	Total weight gain (in pounds)					
	Under 20		20 - 24.9		25 and over	
	Average weight change (in pounds)	Number of cases	Average weight change (in pounds)	Number of cases	Average weight change (in pounds)	Number of cases
5 - 6	-1.36	9	4.16	8	7.08	8
6 - 7	-0.74	14	3.10	17	5.75	28
7 - 8	-1.66	7	0.90	5	7.24	13
8 and over	†	1	2.94	4	6.59	8

* Weight change was measured from the third month weight of the mother.

**Total weight gain was computed from the third month weight of the mother to the delivery weight or a weight taken in the week prior to delivery.

† Too few cases to compute average.

pounds. In other words, by the sixth week postpartum, a woman who gained only 20 pounds returned more nearly to her third month weight after delivery than a woman who gained 25 pounds. This relationship also held true in the other postpartum weeks.

SUMMARY AND CONCLUSIONS

A preliminary analysis was made of the weight records of 484 private patients. For final analysis, 299 were chosen whose periods of observation were longest. The whole group was of good economic status; sixty-two per cent were primiparas. They were slightly older than average childbearing women. A curve of weight gain was constructed. The effect on gain of the factors of parity and non-pregnant weight was measured.

The following conclusions were drawn:

(1) The cumulative gain throughout pregnancy could be characterized almost by a straight line. The greatest increase occurred during the seventh month. A terminal decrease in the rate of gain was apparent. Total average gain was 24.4 pounds.

(2) There was no significant difference between the gain of the primiparas and multiparas.

(3) Weight gain during pregnancy was inversely related to the usual weight of the mother. Regulation in the diet of fattening foods, according to the build of the patient, successfully controlled the gain.

(4) Six weeks after delivery, the majority of women had not yet returned to their pre-pregnant weight. When the return to normal weight should be expected, if it ever occurs, is open to investigation.

(5) The greater the total gain during pregnancy, the greater the difference between the postpartum weight and the weight at the third month of gestation.

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STUDENT AND CHILD RELATIONSHIPS IN THE NURSERY SCHOOL

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Statement of the Problem

What adults say and do in their relationships with children, and how children respond to them, were broad questions with which this study was concerned. Its immediate interest was in the practice of women college students. Their behavior with nursery school children was considered from five points of view: 1) the adult's dominative and integrative contacts, 2) her "helping" the child and leaving him alone, 3) her use of non-recommended methods, 4) her contributing to acceptable and inacceptable practice of children, and 5) possible interrelationships, or individual pattern in a person's association with children, her personal aspects, and her family background. These five approaches were selected because they pertained to basic concepts assumed to be important.

Subjects

The college students who served as subjects for study were participating in nursery school as a part of an introductory child development course. They were freshmen, sophomores, and juniors, enrolled in the University of Maine Department of Home Economics. Observational records were made of 63 different students. Each was observed for at least one ten-minute period. Thirty-nine of the 63 were observed for two ten-minute periods and 22 for three or more periods. The students served as assistants to the nursery school teacher, who was also the instructor of their child development class.

The nursery school in which the students were participating was conducted by the Department of Home Economics. Its enrollment was limited to 12 children. During the time the records were made, October, 1939 to February, 1941, nineteen different children were enrolled. Their ages ranged from 2 to 4 years.

Procedure

The point of departure for study was actual practice with children. An observer came into the nursery school room and sat near a student who was with one child or a group of children. She attempted to write down everything the student said and did with the child, as well as the child's comments and behavior immediately preceding and following the adult contact. The reliability of this method of observation was checked by having two observers record simultaneously. One observer used longhand and the other shorthand. In 80 minutes of simultaneous recording, the two observers had an average of 88 per cent similar sentences or expressions. All records of the study, with the exception of one-half hour, were made by one or the other of these two trained observers.

By a time sampling method (4), the observations were for a ten-minute period. They were made during free play and creative activities. For analysis of the material, a distinction was made concerning the amount of nursery school participation the student had when the record was made. The observation was distinguished as one taking place after the student had at least six hours of participation or as one recorded before six hours had been completed.

The following quotation illustrates the type of record which was made. It represents one-half of a ten-minute observational record of one student. She was seated with a group of children who were using clay.

Miss R--: Would you like to move over so that there's more room? (Margaret doesn't, but there is no conflict due to crowding.)
Margaret: Oh look, my cake broke! (shows her)
Miss R--: Can you put it back together again?
Margaret: No.
Miss R--: You'll have to make another one, won't you? (Margaret does)
Margaret: It broke again.
Miss R--: Oh, isn't that nice? (looking at cake--not having heard what Margaret said)
Ann: I want it. (clay tool Arras has)
Miss R--; After you use it, you let Ann use it. (Arras does.)
Miss R--: Let's let Betty use it now, Arras. (Betty approaches to get tool. Margaret takes it.)
Miss R--: Betty'd like to take her turn at it. (to Margaret who has it)
Miss R--: You sit down, and in just a minute you'll have it. (to Margaret who accidentally drops it, and Betty picks it up)
Miss R--: Margaret, you sit down. You had your turn, and

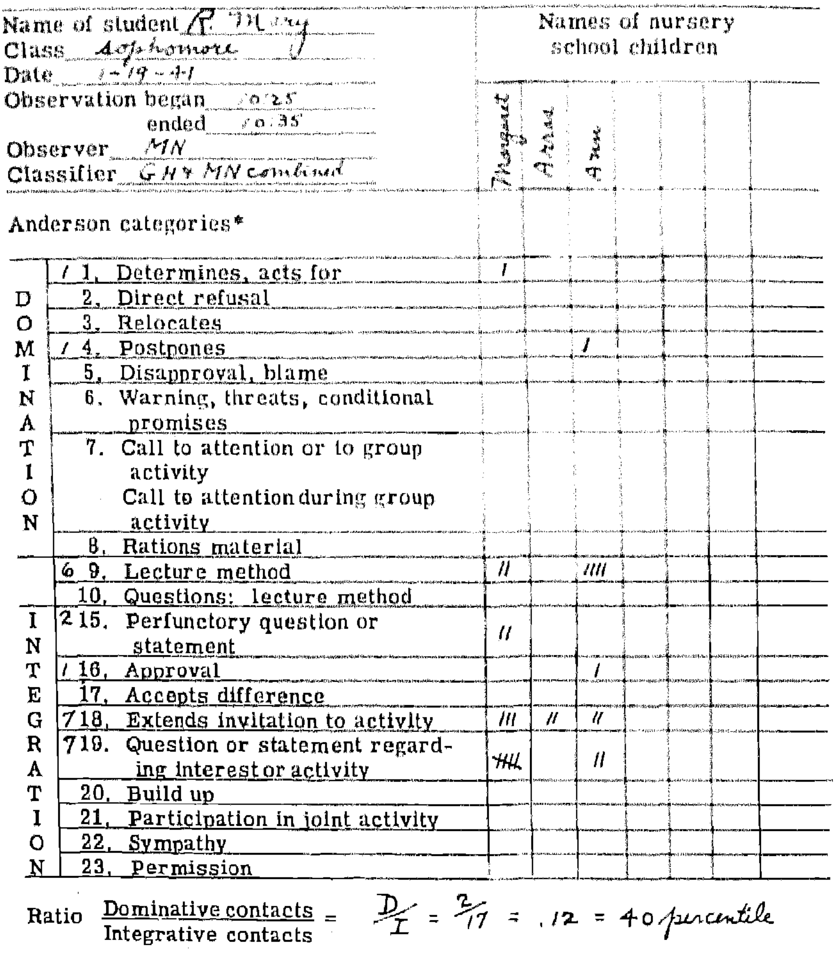
Now let's let Betty. (Betty keeps tool)
Miss R--: Margaret, let's give the dish back to Betty. (Margaret took Betty's dish when Betty took her tool. Margaret returns it.)

In classification of observational records, such as the one just quoted, a variety of procedures was used. Several approaches involved use of a method developed by Anderson (1). The purpose of his technique is to measure domination and socially integrative behavior in teachers' contacts with children. He has listed 19 categories of adult contacts and has considered 8 of them as dominative, 9 of them as integrative, and 2 as "lecture", not clearly classifiable as either dominative or integrative. After an adult's behavior has been classified according to these categories, the ratio of dominative to integrative contacts can then be computed.

In his description of concepts, Anderson says, "Domination is the behavior of a person who is inflexible, rigid, deterministic, who disregards the desires or judgment of others, who himself in the conflict of differences has the answers. Examples are the use of force, commands, threats, shame, blame, attacks against the personal status of another.... The term integrative behavior was chosen to designate behavior leading to a oneness or commonness of purpose among differences. It is the behavior of a flexible growing person who is looking for new meanings, greater understandings in his contacts with others. It is non-coercive; it is the expression of one who attempts to understand others, who is open to new data.... No behavior is entirely integrative; none short of extermination is entirely dominative." (1, p. 89)

For use of this approach of Anderson in classification of the records of this study, some adaptations were made. His categories were used, but further explanation of them and illustrations from nursery school situations were added. The Anderson categories are listed in the sample record in Figure 1. The more specific interpretations of these categories, which the persons experimenting with the classifying found it useful to add, are included in a detailed unpublished report. Items 1 through 8, as defined there, have been considered to be dominative behavior, items 15 through 23, integrative, and items 9 and 10 have been considered to be lecture.

Figure 1 illustrates the record form and shows, by tallies and handwriting, the classification of one ten-minute observation according to dominative, integrative and lecture contacts. The student whose record of behavior with nursery school children is summarized in the sample made 2 dominative contacts and



Name of student R. Mary
Class Sophomore
Date 1-19-41
Observation began 10:25
ended 10:35
Observer MN
Classifier GH + MN combined

Names of nursery school children

Anderson categories*

			Margaret	Anna	Ann				
DOMINATION	/	1. Determines, acts for	/						
		2. Direct refusal							
		3. Relocates							
	/	4. Postpones			/				
		5. Disapproval, blame							
		6. Warning, threats, conditional promises							
		7. Call to attention or to group activity Call to attention during group activity							
		8. Rations material							
	6	9. Lecture method	//		////				
		10. Questions: lecture method							
INTEGRATION	2	15. Perfunctory question or statement	//						
	/	16. Approval			/				
		17. Accepts difference							
	7	18. Extends invitation to activity	///	//	//				
	7	19. Question or statement regarding interest or activity	𝍸		//				
		20. Build up							
		21. Participation in joint activity							
		22. Sympathy							
		23. Permission							

Ratio $\frac{\text{Dominative contacts}}{\text{Integrative contacts}} = \frac{D}{I} = \frac{2}{17} = .12 = 40$ percentile

Figure 1

CLASSIFICATION OF INDIVIDUAL STUDENT'S OBSERVATIONAL RECORD ACCORDING TO DOMINATIVE, INTEGRATIVE, AND LECTURE CONTACTS*

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* The classification form, developed by Harold Anderson, is described in his article in the June 1939 issue of Child Development.

17 integrative contacts, which make a ratio of .12.

Final classification of a student's observational record into dominative, integrative, and lecture contacts, represented the combined judgment of two classifiers. Each classifier first classified the record separately. Then, after variations in category placement had been noted, the two classifiers decided, by discussion, which category to use for the contact upon which there had been disagreement. Actually, the amount of disagreement was comparatively small.

This ability of the two persons, who classified all of the records, to classify similarly, was checked by comparing and correlating their separate classifications. Agreement between the two classifiers was high on what constituted a contact and on whether that contact was dominative or integrative. In 200 ten-minute observational records, one classifier had 5054 as her total number of contacts and the second classifier had 4949 (23 of which were not called contacts by the first classifier); they agreed on what was called a contact in 4926 instances, i.e., 97 per cent of the time. Coefficients of correlation between the two classifiers in their placement of contacts as dominative or integrative were from .91 ± .023 to .99 ± .0007. Agreement was also checked on the specific category of the dominative, integrative, or lecture sections in which the contact was classified. The coefficient of correlation for category placement of 5077 contacts by two classifiers classifying separately was .79 ± .003. This correlation seemed high enough to warrant use of the specific categories in the procedures which are summarized in the following paragraphs.

One approach to a student's observational record used the ratio of dominative to integrative contacts as a measure of her dominative and integrative behavior. A second approach made use of the dominative, integrative, and lecture classification procedure, just described, but selected only certain items for consideration. The purpose of this second approach was to measure the amount of "helping" behavior which a student showed in her relationship with children. This "helping" behavior was defined as items 9, 10, 19, and 21, in the adapted guide based on Anderson's categories. These categories are listed in the record form reproduced in Figure 1. They included lecturing to the child, in the sense of defining a problem, explaining or demonstrating a method; showing interest in the child's activity; participating jointly with him. The number of contacts of this type in a ten-minute record served as a measure of "helping" behavior.

A third approach was concerned with the use of certain non-recommended methods by the adult in her associations with children (3). Negative instead of positive, general instead of specific, and verbose instead of simple statements were considered to be of a type not to be recommended. Negative verbalization was measured by counting the number of contacts which were direct refusals, disapproval or blame, warnings or threats, (categories 2, 5, and 6 of Figure 1). General verbalization had as its measure the number of general words as defined in a detailed guide. For example, use of the words "quiet", "something else", "nice", or "like this", without further clarification, was considered to be generalization. They were counted as such when used in instances other than praise, sympathy, or interest. Verboseness was determined by counting the number of words spoken by the adult during the ten-minute observation. If a student said more than one-half of the maximum number of words per ten-minute record, her response was considered verbose.

The measures described up to this point were concerned with the adult's verbalization and action. For a more complete understanding it was necessary to study not only what the adult said and did, but also what the children's responses were. A fourth approach to the observational records had this purpose of indicating whether the student seemed to be contributing to acceptable or inacceptable practices of the child. In the classification procedure which was developed to provide this information, children's practices were listed under the headings of adjustment to routine, constructive use of equipment and materials, social adjustment, and individual well-being.

If a child's behavior seemed to be in accordance with aims accepted by the classifier, it was scored as a plus (+) which counted as a contribution of the adult to acceptable practice of children. If the child's behavior was not in accordance with aims accepted by the classifier, it was scored as a minus (-) and was counted as a contribution to inacceptable practice. The adult's contribution to children's behavior was the ratio of these minus to plus tallies during a ten-minute period. In the sample record of Figure 2, there were two inacceptable and five acceptable practices of children with which the student was, or should have been, concerned. Consequently, her contribution to the children's behavior was the ratio of two to five, or .40.

In this type of classification of an observational record, detailed instructions and illustrations served as a guide. The classifier was instructed to consider the adult to be concerned, not only where he was attempting to give guidance, but also where, according to the classifier's judgment, guidance should have been given and was not forthcoming. If the child's activity could have been placed under several headings in the classification form, then the more immediate or pressing was selected.

Name of student R. Mary Observation began 10:25
Class sophomore ended 10:35
Date 1-19-41 Observer MN
Classifier GH & MN combined

	Names of nursery school children					
	Anne	Margaret	Ann			
A. Adjustment to routine						
1. dressing and undressing						
2. bathroom						
3. eating, drinking juice or water						
4. remaining in play space						
5. putting away and cleaning up						
6. miscellaneous						
B. Constructive use of equipment and materials (acceptable place, amount, skill, etc.)						
7. large equipment and furniture						
8. small equipment						
9. aquarium						
10. beads						
11. blocks						
12. books						
13. broom						
/ 14. clay			+			
15. crayons						
16. doll equipment						
17. hammer and nails						
18. paint						
19. paste						
20. piano						
21. plants						
22. sand						
23. scissors						
24. water						
25. miscellaneous						
C. Social adjustment						
26. social play						
/ 27. sharing (using equipment together)		+				
/ 28. taking turns (waiting for turn)	+					
29. respect for property rights						
2 a. asks to use material			+ -			
2 b. stops taking possession of another		- +				
c. repairs damage to another's work						
30. consideration for others						
a. being "gentle" to others						
b. stops hurting another						
31. adjustment to custom (incl. furniture)						
32. miscellaneous						
D. Individual "well-being"						
33. stops crying						
34. safety						
35. healthful or hygienic practice (in play)						
36. miscellaneous						
37. stopping negative or destructive behavior but not substituting the desirable in the situation (to be used if other items do not apply)						

Ratio $\frac{\text{Inacceptable practices}}{\text{Acceptable practices}} = \; -/+ = 2/5 = .40 =$ 46 percentile

Figure 2

CLASSIFICATION OF INDIVIDUAL STUDENT'S OBSERVATIONAL RECORD ACCORDING TO ADULT CONTRIBUTION TO INACCEPTABLE AND ACCEPTABLE PRACTICES OF CHILDREN

The procedure considered only the more objective practices, more easily agreed upon as socially acceptable, healthy, or skillful, and did not attempt to judge the individual child's progress in self-reliance, initiative, and attitude toward authority. Although these less tangible aspects of growth were not considered, it was assumed that the classifiers needed to be trained persons. As in the case of the dominative and integrative behavior, the combined judgment of two classifiers provided the final classification of a student's record.

Reliability of this method was checked by studying agreement between two classifiers, classifying separately. Agreement on whether a child's practice was acceptable or inacceptable was very high. In no instance where both classifiers considered a portion of a record as a practice with which the adult was or should have been concerned, did they disagree on whether the contribution was a plus or a minus. In separate classifications of 102 ten-minute records, one classifier had 551 practices, and the other had 485. They agreed in calling the same portion of a record a practice in 471 instances. This made a per cent agreement of 85 to 97 per cent on what constituted a practice. When each of the classifiers was considering the same portion of a record a practice, they placed it in the same specific category (assigned it the same number on the classification device), 83 to 100 per cent of the time. Variation in per cent is due to use of the smaller or larger total.

When the student's observational record had been classified according to contribution to children's practice, use of non-recommended methods, "helping" the child, and dominative and integrative contacts, then possible interrelationships between these measures of behavior were studied. Furthermore, possible interrelationships between them and the student's own family background and personal aspects were considered. This fifth approach was concerned with individual pattern. A biogram method (2) presented the information about an individual in a graphic form. As much information as possible was converted to a percentile interpretation and then plotted.

Figure 3 shows the graphing in profile form of material concerning an individual student. The majority of items listed there regarding personal aspects and family background are self-explanatory, such as height and weight, or well-known techniques, such as the Bernreuter personality inventory. Two of the items were based on measures developed for use in this study. A rating sheet was devised to yield a score on the dominative and integrative behavior of the student's mother and father. It was a check list or questionnaire with the same categories as those of the device previously described for

Name R. Mary Birthdate 1-15-21 Age at college ent. 18 years 9 months
Home address Name of town Rockland, Maine Size of town 9000 Rural ( )
Early life, city, small town, farm - 1st 10 years town 2nd 10 years town
Position in family 1. Bro. 2. Sis. 3. ✓ 4. Sis. 5, 6.
Father - age 47 Occupation Saw Mill Owner Birthplace Eastport, Maine
Mother - age 44 Occupation Homemaker Birthplace Bangor, Maine
Health - Student considers self - very strong ✓ mod. strong delicate
Apparent health N date 9-21-39
Physical exam. remarks and recommendations

BIOGRAM

		Date	Score		%ile
Family background	1. Dominative-integrative behavior of father	1-41	.55		72
	2. Dominative-integrative behavior of mother	1-41	.60		82
	3. Size of family	9-29-39	5		83
Personal aspects	4. Bernreuter Personality Inventory Self-sufficiency	9-39	13	56%ile	82
		10-40	-37	28 "	44
	Neuroticism	9-39	-86	30 "	10
		10-40	-37	51 "	51
	Dominance	9-39	66	67 "	91
		10-40	19	43 "	48
	5. Personality rating chart - Self	3-40	21		81
	Faculty (Average of 3)	3-40	22		77
	6. Age	10-1-39	18-9		75
	7. Height	9-21-39	63.5		50
	8. Weight	9-21-39	125.5	+4	59
	9. Intelligence	9-21-39	99		89
	10. Grade point average	6-40	2.91		90
	11. Ch. Dev. course gr.	1-41	B		83
Relationships with nursery school children (First and second records after at least six hours nursery school participation)	12. Dominative / Integrative ratio	1-9-41	2/17	.12	40
		1-16-41	0/16	0	14
	13. "Helping" behavior	1-9-41	6		67
	a. "Lecture" contacts	1-16-41	7		70
		1-9-41	4		54
	b. Interest contacts	1-16-41	11		80
		1-9-41	0		12
	c. Joint participation	1-16-41	1		39
	14. Use of non-rec. methods	1-9-41	0		
	a. Negative verbalization	1-16-41	0		
		1-9-41	1		
	b. Generalization	1-16-41	0		
		1-9-41	156		65
	c. Number of words	1-16-41	168		69
	15. Inacceptable (-) / Acceptable (+) ratio	1-9-41	2/5	.40	46
		1-16-41	1/3	.33	40

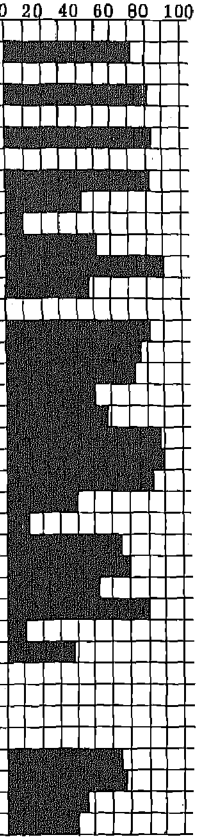

Figure 3

FACE SHEET AND BIOGRAM OF INDIVIDUAL STUDENT classifying the student's dominative and integrative behavior with nursery school children. The student was asked to recall how frequently each parent showed the various types of contacts, such as direct refusal, or acceptance of difference of opinion. For one personality measure, the student's personality rating chart was converted to a numerical score. Numerical values were arbitrarily assigned to check marks, which rated the individual average, above or below average in various qualifications.

For the purposes of this study the biogram served as a record form summarizing information concerning the individual student's family background, personal aspects and nursery school behavior. In the consideration of interrelationships of these aspects, raw scores were used. The percentile placements included in Figure 3 suggest possible uses of such a method of interpretation. However, percentiles did not enter into treatment of the data.

Findings

Findings were of two general types. One concerned interrelationships within the individual student. A second type of findings had less emphasis on the individual and more emphasis on the composite or group picture. The disadvantages of a composite picture were realized, but it seemed to be a practical means of considering general trends.

Students, as a group, were found to be more integrative than dominative in their relationships with nursery school children. This conclusion was based on an analysis of 63 observational records classified according to an adaptation of the Anderson (1) classification device. Each of the 63 different students, whose records were used, had been observed for a ten-minute period, after she had participated in nursery school for at least six hours. The records included a total of 1282 contacts of adults with children, 151 of which were dominative, 844 were integrative, and 287 were lecture contacts. The ratio of all the dominative to all the integrative contacts was .18. More specific information concerning the ratio of dominative to integrative contacts is provided in Table 1. In the table the mean ratio is .35 for freshmen, .23 for sophomores, and .22 for juniors. In this division of students according to their college class, the juniors showed a greater homogeneity than the freshmen and sophomores. The range of ratios, the median, mean, and sigma were lower for the juniors.

Just as the analysis in Table 1 revealed college class as a possible variable affecting the ratio of dominative to integrative contacts, other analyses revealed other possible influences.

TABLE 1

DOMINATIVE AND INTEGRATIVE BEHAVIOR OF STUDENTS WITH CHILDREN (BASED ON FIRST TEN-MINUTE OBSERVATIONAL RECORDS AFTER AT LEAST SIX HOURS NURSERY SCHOOL PARTICIPATION)

	N	Ratio of Dominative to Integrative Contacts				
		Range	Median	Mean	Sigma	PE Sigma
Class of 1941 (juniors)	23	0 to .69	.14	.22	.21	.02
Class of 1943 (freshmen and sophomores)	40	0 to 1.24	.17	.30	.32	.02
Freshmen of class of 1943	22	0 to 1.24	.18	.35	.36	.04
Sophomores of class of 1943	18	0 to 1.04	.12	.23	.25	.03

Influence of the amount of nursery school participation was suggested by a comparison of records of the same students made before and after six hours of nursery school. The mean ratio of dominative to integrative contacts rose with further participation. Twelve freshmen for whom two records were available showed a change from a mean ratio of .19 to .31 and 16 sophomores from .18 to .21 when records before and after six hours of participation were compared. The sophomores also had a third record made after additional experience. The mean ratio for these additional records made still later in the semester was .24. Although the ratios rose with further experience they were, in each instance, below .32.

Ratios were also low when the possible influence of individual nursery school children was investigated. Each one of the 19 nursery school children with whom the students were associated received more integrative than dominative contacts. In the case of nursery school activity, the implication was similar to that for the other variables which were considered. Proportions of dominative to integrative contacts of students with children varied according to college class, amount of nursery school participation, individual children, and activity, but never to the extent of ruling out the broad conclusion that students were more integrative than dominative.

In their dominative contacts, the most frequent behavior was to warn or threaten. It represented 25 per cent of the total of 151 dominative contacts in the 63 records. To directly refuse and to ration material were the least frequent classifications with 4 per cent each. Most frequent integrative behavior was a question or statement regarding the child's interest or activity, which accounted for 45 per cent of the total of 844 integrative contacts in the 63 records. Next in order of frequency with 21 per cent was the category, to extend an invitation to activity, which related to solution of conflict, improved behavior or adjustment to routine by the child. Participation in joint activity with the child represented 16 per cent of the total. The category of "build up" was of special interest because of its association with the development of an alert, inquiring, "problem solving" attitude. Only 2 per cent of all integrative contacts were of this "build up" type, which helped the child to arrive at a better definition of a problem or a better solution without giving the final answer.

The contacts accepted as indications of "helping" behavior tended to be either frequent or rare in an individual student. Although contacts of this type, i.e., lecture, interest, and joint participation, comprised 64 per cent of all contacts, a significant proportion of students made none or very few of them. Findings showed extremes to be more prevalent than an intermediate number of "helping" contacts. In Table 2 information is summarized for juniors and for freshmen and sophomores grouped. With but one exception, 35 per cent or less of the students had an intermediate number. On the other hand, with the one exception, 65 per cent or more had none or only one, or else, six or more contacts of a particular category considered to mean helping the child. Such information may be pertinent to a concept which accepts balance in helping and leaving alone as important for adequate guidance.

Use of non-recommended methods, such as negative verbalization, generalization, and verbosity, was rare. Proportions of non-recommended contacts to total number of contacts are presented in Table 3. According to this table, students seldom made direct refusals, showed disapproval or blame, warned or threatened. These forms of negative verbalization represented 7 per cent of all contacts of junior students and 5 per cent of all contacts of freshmen and sophomores. Furthermore, they were rarely general instead of specific in their suggestions to children. General statements represented only one per cent of all contacts for juniors and two per cent for freshmen and sophomores.

TABLE 2

STUDENT BEHAVIOR HELPING THE CHILD OR LEAVING HIM ALONE (BASED ON FIRST TEN-MINUTE OBSERVATIONAL RECORDS AFTER AT LEAST SIX HOURS NURSERY SCHOOL PARTICIPATION)

	Category	Per cent of Students		
		Leaving alone with 0 or 1 contacts	Intermediate with 2 to 5 contacts	Helping with 6 or more contacts
Class of 1941 (juniors) N = 23	Lecture	34	57	9
	Interest	35	35	30
	Joint participation	60	27	13
Class of 1943 (freshmen and sophomores) N = 40	Lecture	32	31	37
	Interest	35	35	30
	Joint participation	52	33	15

TABLE 3

USE OF NON-RECOMMENDED METHODS BY STUDENTS WITH CHILDREN (BASED ON FIRST TEN-MINUTE OBSERVATIONAL RECORDS AFTER AT LEAST SIX HOURS NURSERY SCHOOL PARTICIPATION)

Category	Per cent of Total Contacts*	
	Class of 1941 (juniors) N = 23	Class of 1943 (freshmen and sophomores) N = 40
Negative Verbalization	7	5
General Verbalization	1	2
Total	8	7

* Total number of contacts is 316 for the class of 1941 and 966 for the class of 1943.

A significant proportion of students showed no contacts of a particular non-recommended type. When juniors of the class of 1941 and freshmen and sophomores of the class of 1943 were considered separately, 56 per cent of those in the class of 1941 had no negative verbalization and 91 per cent had no general verbalization. For the class of 1943, 47 per cent had no negative contacts; 67 per cent had no general statements. These per cents indicated variations in use of non-recommended methods according to college class. There were more juniors than freshmen and sophomores grouped who had no contact of a particular type.

Freshman use of the non-recommended methods was more frequent than sophomore. In negative verbalization the proportion for freshmen was approximately 5 per cent points higher than for sophomores. In general verbalization it was two per cent points higher. For the 12 freshmen, who had records early in the semester and after 6 hours of participation, negative verbalization represented 8 per cent of all contacts in the early records and 7.8 per cent after further participation. Their generalization rose from 2.0 to 3.2 per cent. For 16 sophomores, the per cent of negative verbalization was 3.3 per cent early in the semester and 2.3 per cent after at least 6 hours of participation. Sophomore generalization was .5 per cent early in the semester and 1.1 per cent at the later time. In both classes variation according to amount of participation was very slight. With further nursery school experience, both freshmen and sophomores showed a slight decrease in negative contacts and a slight increase in general verbalization.

A third type of non-recommended method, verboseness, was also found to be rare. Seventy per cent of the juniors in the class of 1941 spoke less than one-half the maximum number of words of any ten-minute observational record in the junior group. The maximum number of words of any junior was 230. The maximum for freshmen and sophomores of the class of 1943 was 540 words. Eighty-six per cent of the freshmen and sophomores said less than one-half of this maximum. Fifty-five per cent of them said less than one-half the junior maximum of 230 words. This 55 per cent compared to the 70 per cent for the juniors indicates the juniors talked less than the freshmen and sophomores considered as a group. Considered separately, sophomores were more verbose than freshmen. From early in the semester until a later time, per cent of freshmen saying less than one-half the maximum decreased from 100 to 92 per cent; per cent of sophomores decreased from 88 to 81 per cent. Both groups talked more as amount of nursery school experience increased.

When responses of the nursery school children were studied, the students were found to be contributing to more socially acceptable and healthy than inacceptable and unhealthy practices of the children. For the 63 students with ten-minute observational records made after at least six hours of nursery school participation, the ratio was .40, when all their contributions to inacceptable practices were considered in proportion to all their contributions to acceptable practices. In 244 contributions to children's behavior, 70 were minus; 174 were plus; this makes the .40 ratio of inacceptable to acceptable. Table 4 presents more specific information concerning students' contributions to behavior of the children. In this table, the finding for the total group, i.e., the presence of mean ratios below .60, probably should have more attention than comparisons between classes.

TABLE 4

STUDENTS' CONTRIBUTION TO ACCEPTABLE AND INACCEPTABLE PRACTICE OF CHILDREN (BASED ON FIRST TEN-MINUTE OBSERVATIONAL RECORDS AFTER AT LEAST SIX HOURS NURSERY SCHOOL PARTICIPATION)

	N	Ratio of Students' Contributions to Inacceptable (-) and Acceptable (+) Practices of Children				
		Range	Median	Mean	Sigma	PE Sigma
Class of 1941 (juniors)	20*	0 to 2.0	.04	.50	.78	.08
Class of 1943 (freshmen and sophomores)	40	0 to 1.2	.45	.51	.41	.03
Freshmen of class of 1943	22	0 to 1.0	.42	.44	.36	.04
Sophomores of class of 1943	18	0 to 1.2	.52	.60	.44	.05

* This number of cases differs from the number in Table 1 because three students' records contained no practices of children in response to the student.

Comparisons are questionable because of the small number of contributions to children's practice per record. When none or only one contribution of a plus or minus type was made, a wide range of ratio resulted, although the variation was based on a difference of a single practice. With this understanding of the limitations of the measure, it is to be noted that juniors had the low median of .04. These same juniors had the intermediate median in ratio of dominative to integrative contacts reported in Table 1. Sophomores had the lowest median for dominative integrative ratio. These sophomores, who were the most integrative of the three classes, had the highest median ratio of contributions to minus and plus practices of children. Their contributions to inacceptable behavior were greater than those of the juniors or of the freshmen. Further data would be necessary to determine a possible optimum in the sense of relationship between dominative integrative ratio and ratio of contributions to inacceptable and acceptable practices of children. The evidence presented here and material to be presented in the section on individual pattern suggest that neither the highest nor the lowest in dominative integrative ratio accompanies the lowest in minus plus ratio of contributions to children's behavior.

As was true in the case of dominative integrative behavior, students' contributions to the practice of children varied according to college class, amount of nursery school participation, individual children, and nursery school activity. Change in mean ratio was slight when records made early in the semester were compared with those made after at least six hours of nursery school experience. Mean ratio for 12 freshmen changed from .43 to .47. The change for 16 sophomores was from .62 to .58. These same sophomores had another record made still later in the semester. After this additional nursery school experience their mean ratio of minus to plus contributions to children's practice dropped to .41. Although 3 of the 19 children with whom the students were associated received more contributions to inacceptable than to acceptable practice, the general picture was one which bore out the broad conclusions previously stated. Most individual children practiced more that was acceptable than inacceptable in their associations with students. Whatever the nursery school activity, the students contributed to more acceptable than inacceptable practices.

Material up to this point has been concerned with students as a group. The following findings concern the individual student, the interrelationship of her background, personal aspects, and behavior with nursery school children. From the many possibilities for study of the individual, a few measures were selected for investigation.

One finding concerning interrelationship within the individual student showed correlation of dominative integrative behavior in one ten-minute observational record with other ten-minute samples. For the 22 students for whom records were made at three different times the intercorrelations in dominative integrative ratios were as follows:

First ten-minute observational record before 6 hours nursery school participation and first after at least 6 hours, $r = .555$, $PE_r = .099$

First ten-minute observational record before 6 hours nursery school participation and second after at least 6 hours, $r = .309$, $PE_r = .128$

First ten-minute observational record after 6 hours nursery school participation and second after at least 6 hours, $r = .661$, $PE_r = .081$

The average intercorrelation is .508 which yields an estimated reliability for the sum or average of three ten-minute observations of .755 by use of the Spearman-Brown prophecy formula. When just two records are used, the first and second after six hours of nursery school participation, .709 is the reliability coefficient for the average of two ratios.

Because of its reliability and its pertinence to basic concepts, dominative integrative behavior was selected as one measure in the light of which to consider other measures. The individual student's dominative integrative ratios for first and second records after at least six hours of nursery school participation were averaged. This average was correlated with other measures of behavior with children, family background, and personal aspects. These correlations are presented in Table 5. For the 39 students for whom two records after at least six hours of nursery school experience were available, certain items showed some correlation; others showed very little or none.

According to Table 5, dominative integrative behavior of the father is an aspect of family background which yielded some suggestion of trend. As the ratio of dominative to integrative behavior of the student's father increased (as measured by her response to a questionnaire), the student's own ratio in her relationships with nursery school children tended to increase. The more dominative students had the suggestion of a tendency to have more dominative fathers. The coefficient of correlation was .30 ± .10. No suggestion of trend was evident in relation to dominative integrative behavior of the mother or size of family.

When personal aspects of the student were correlated with her dominative integrative behavior with nursery school children, the greatest suggestion of trend was in the case of intelligence. This coefficient of correlation was -.41 ± .09. Height

TABLE 5

CORRELATION BETWEEN DOMINATIVE INTEGRATIVE BEHAVIOR OF STUDENT WITH CHILDREN AND FAMILY BACKGROUND, PERSONAL ASPECTS, AND OTHER RELATIONSHIPS WITH CHILDREN

		Number of Students*	Correlation with Student's Ratio of Dominative to Integrative Contacts with Children**	
			r	PE_r
Family background	Dominative-integrative behavior of father	34	.30	.10
	Dominative-integrative behavior of mother	37	.08	.11
	Size of family	37	-.10	.11
Personal aspects	Bernreuter Personality Inventory			
	Self-sufficiency	37	.02	.11
	Neuroticism	37	-.19	.11
	Dominance	37	-.07	.11
	Personality rating chart			
	Self	28	.07	.13
	Faculty	29	-.01	.13
	Age	39	.26	.10
	Height	37	-.30	.10
	Intelligence	37	-.41	.09
	Child Development course grade	39	-.25	.04
Relationships with nursery school children	Total number of contacts with children	39	-.16	.08
	Total number of contributions to children's practice	39	.52	.08
	Ratio of contributions to inacceptable and acceptable practices of children (-/+ ratio)	39	.49	.06

* Variation in number of students is due to lack of information for certain students.

**Ratio of dominative to integrative contacts used in these correlations is the average of two ratios, those of the student's first and second records after at least six hours of nursery school participation.

and age also yielded some suggestion of trend, with coefficients of -.30 ±.10 and .26 ±.10. As ratio of dominative to integrative behavior increased, intelligence and height tended to decrease, age to increase. In other words, the more integrative student tended to be more intelligent, taller and younger. In this connection, it is interesting to speculate on the interrelationships of these personal aspects. Further speculation might consider the part they play in a situation such as the one being studied where students were receiving class instruction and were under the supervision of the instructor in the nursery school. In the coefficients of correlation for personality measures and for grade in the introductory child development course, the figures were lower than those just stated.

In relationships with nursery school children, increase in ratio of dominative to integrative behavior tended to accompany an increase in the total number of contributions to children's practice with which the student was or should have been concerned. This coefficient of correlation was .52 ± .08. Not only an increase in the number of contributions to children's practice, but also an increase in the proportion of those practices which were inacceptable tended to accompany a rise in dominative integrative ratio. The correlation of dominative integrative ratio with ratio of contributions to inacceptable and acceptable practices of children was .49 ± .06. When all contacts were considered and not just those where the student was or should have been concerned with the child's practice, the correlation was low and negative, i.e., -.16 ± .08.

TABLE 6

RELATIONSHIPS BETWEEN STUDENTS' CONTRIBUTION TO CHILDREN'S PRACTICE AND DOMINATIVE INTEGRATIVE BEHAVIOR (BASED ON AVERAGE OF FIRST RECORD BEFORE SIX HOURS NURSERY SCHOOL PARTICIPATION AND FIRST AND SECOND AFTER AT LEAST SIX HOURS)

Range of Mean Dominative Integrative Behavior	Number of Students	Mean Contribution to Children's Practice			
		-/+ Ratio	Number of Practices		
			-	+	Total
0 to .09	9	.45	1.05	2.54	3.62
.10 to .19	5	.30	.9	3.52	4.42
.20 to .29	5	.52	2.02	3.78	5.84
.30 to .89	3	.69	2.63	4.53	7.2

The inadvisability of overemphasis of any of these correlations is illustrated in Table 6. This table indicates suggestions of trends; it also shows deviations from consistent trends. A high score in one measure may accompany an intermediate score in another measure. Use of total score instead of proportion may yield findings with different implications.

In Table 6 contributions to children's practice served as a point of reference. As in the case of the correlations previously stated, rise in dominative integrative ratio was accompanied by rise in total number of contributions to children's practice. As mean dominative integrative ratio went from 0 to .89, mean number of total contributions to children's practice went from 3.62 to 7.2. Likewise, the trend of increase was consistent for the number of contributions to acceptable practice. These rose from 2.54 to 4.53, as the dominative integrative ratio rose. On the other hand, number of contributions to inacceptable practice, as well as ratio of - to + contributions, did not follow a consistent trend. The smallest number of minus contributions and the lowest proportion of - to + appeared at an intermediate level of dominative integrative behavior. The students whose mean dominative integrative ratio was from .10 to .19 had a mean -/+ ratio of .30 and a mean number of minus contributions of .9. Students with dominative integrative ratios above and below this level had a larger proportion and larger total number of minus contributions. This intermediate level of dominative integrative behavior as perhaps significant for low -/+ ratio was not brought out by the coefficient of correlation.

Such complexity of pattern, as well as the characteristics of the measures used, make it important to stress the need for further study. Recognition of the limitations of the measure was especially necessary in the case of contributions to children's practice and amount of negative verbalization. In both instances, as has been previously stated, the total number of such contacts was comparatively small in a ten-minute period. Neither the ratio of contributions to inacceptable and acceptable practice of children nor the amount of negative verbalization correlated from one ten-minute record to another. To provide a somewhat larger sample, either two or three ten-minute observations served as the basis for the material reported in Tables 5, 6, and 7.

When amount of negative verbalization served as a measure to which to relate contributions to children's practice, some relationship between the two was found. The coefficient of correlation, based on two records of 39 students, made after at least six hours of nursery school participation was .50 ± .08. As proportion of contributions to inacceptable practice rose, use of the non-recommended method of telling the child what not to do, tended to increase.

In further study of individual pattern, which made use of some of the findings already stated, six aspects of the student were considered. Three were measures of relationships with children, i.e., dominative integrative ratio, ratio of contributions to inacceptable and acceptable practice of children and amount of negative verbalization. They were selected because of their indication of quality of relationships with children and not just quantity. In addition to the fact that concepts of the study accepted each one as important, findings showed each related to another. Increase in ratio of contributions to inacceptable and acceptable practices of children tended to accompany increase in amount of negative verbalization. Some tendency was found for low proportion of dominative behavior to accompany low proportion of contributions to inacceptable practices of children. However, evidence suggested that not the lowest but an intermediate ratio of dominative to integrative behavior was perhaps predictive of the lowest proportion of - + contributions. This variation was given some recognition in the rough sorting process which considered the student's position only as above or below the median.

Not only the three measures of the student's relationships with children but also three measures of her family background and personal aspects were considered in the approach which attempted further study of individual pattern. Dominative integrative behavior of the student's father, her intelligence and height were the personal and background measures which were used. They were selected because their correlations with the student's dominative integrative behavior were highest. Height and intelligence had negative correlations and dominative integrative behavior of the father had a positive correlation with a high proportion of dominative behavior in the student.

To consider at the same time the six measures which seemed perhaps predictive of recommended relationships with children the procedure indicated in Table 7 was used. The individual student was considered according to her position above or below the median in the six measures. The medians were those of a larger group, i.e., the college class to which the 22 students belonged. In computing a correlation, on one axis was number of items present, for possible assets in relationships with children (D/I ratio, -/+ ratio, and number of negative contacts below the median). On the other axis was number of items present, for possible personal and background assets, (intelligence and height above the median, D/I ratio of the father below the median). Table 7 indicates the distribution of cases for this multiple grouping on both axes. The coefficient of correlation for the information pictured in the scatter diagram arrangement of the Table is .41 ± .12. To consider the certainty of this correlation where each axis had only four divisions, the coefficient of contingency was computed. This coefficient is .50.

TABLE 7

INDIVIDUAL PATTERN OF STUDENT BACKGROUND, PERSONAL ASPECTS, AND RELATIONSHIPS WITH NURSERY SCHOOL CHILDREN

Information concerning Relationships with Children:* D/I ratio below median? -/+ ratio below median? Number of negative verbalizations below median?	Information concerning Background and Personal Aspects: Intelligence above the median? Height above the median? D/I behavior of the father below the median?			
	0 of 3 items present N = 2	1 of 3 N = 5	2 of 3 N = 12	3 of 3 N = 3
3 of 3 items present N = 6			5	1
2 of 3 items N = 7		2	4	1
1 of 3 items N = 6	1	2	3	
0 of 3 items N = 3	1	1		1

* This information concerning relationships with children is based on the average of 3 records for each student, one record before 6 hours nursery school participation, and two records after 6 hours.

In terms of pattern for the individual, Table 7 gives the suggestion that presence of more of the items in nursery school relationships (D/I ratio, -/+ ratio, and number of negative verbalizations below the median), tends to accompany presence of more of the items in background and personal aspects (intelligence and height above the median, D/I ratio of the father below the median). In view of the complexity of the individual, any suggestion that six rough measures, such as these, yield pertinent information, needs to include recognition of the fact that such information is only a slight step in the direction of understanding of adult-child relationships.

Summary and Conclusions

Student practice with nursery school children tended to be acceptable but insufficient. Sixty-three college girls, participating in nursery school as part of an introductory child development course, were observed during free play and creative activities by a time sampling method. Verbatim records were made of what they said and did and the children's behavior in relation to them as they assisted the nursery school teacher. The students' practice was in agreement with recommended adult-child relationships in the following respects. They were more integrative than dominative. They seldom used non-recommended methods: their verbalization was seldom negative, general or verbose. They contributed to more acceptable and healthy than inacceptable and unhealthy practices of the children. On the other hand, student behavior seemed insufficient in the following respects. They rarely used "build up" (defined by Anderson (1) as the adult's helping the child to arrive at a better definition of a problem or a better solution, without giving the final answer). They showed extremes in helping the child and leaving him alone. Student practices with children showed some variation according to college class, amount of nursery school participation, individual children with whom the student was associated, and activity of the children.

Pattern in the individual's family background, personal aspects, and relationships with children, warranted further study. Suggestions of interrelationship were found in various aspects of the student's behavior with children. An intermediate proportion of dominative to integrative behavior tended to accompany a high proportion of contributions to acceptable practices of children. Proportion of contributions to inacceptable practice of children tended to increase as amount of negative verbalization increased. Increase in ratio of dominative to integrative behavior tended to accompany increase in number of practices of children to which the adult was or should have been contributing. Suggestions of pattern to be investigated were also found in the individual's family background, personal aspects, and behavior with children. The following aspects seemed significant for desirable student nursery school child relationships: proportion of dominative to integrative behavior of the father below the median, height and intelligence above the median, proportion of dominative to integrative behavior, proportion of contributions to inacceptable and acceptable practices of children and number of negative verbalizations, all below the median.

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(3) Johnson, Marguerite Wilker, Verbal influences on children's behavior. University of Michigan Press, Ann Arbor, 1939.

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[1] *The more detailed study, which this article summarizes, is on file at the University of Michigan Library, Ann Arbor, Michigan. In the preparation of the material for a doctoral dissertation, Dr. Willard C. Olson gave valuable assistance. Another study which considered students not only in nursery school but also in other aspects of a Home Economics Education curriculum, will be reported later.*

A PRELIMINARY SCALE FOR THE MEASUREMENT OF THE MENTALITY OF INFANTS

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Every parent is interested in the mentality of his child. He generally believes it to be unusually bright and can discover numerous signs which demonstrate this fact. To date relatively little has been accomplished in the accurate measurement of the mentality of children less than two years of age. The most notable exceptions to this are the tests devised by Gesell,[1] Buehler,[2] Shirley,[3] Fillmore,[4] and Cattell.[5]

The present study is the direct result of a request from the Cradle in Evanston for a method of determining which infants, if any, should not be placed for adoption because of mental deficiency. Those in charge of the Cradle as well as those in most other placement agencies believe the earlier adoption is possible the better. Generally if there is no indication of mental or physical defect the infants at the Cradle are placed by the age of three months. Because the tests constructed by earlier investigators generally start not earlier than three months, or in those cases in which they start earlier, consist of only a few items, the present authors began the construction of a new battery of tests for use with younger infants. All the available tests were carefully studied and those items which gave promise of value were used or adapted for use in an experimental battery. In addition a series of new items was

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[1] *A. L. Gesell, The Mental Growth of the Pre-School Child, New York, Harpers, 1940, and A. L. Gesell and Helen Thompson, The Psychology of Early Growth, New York, Macmillan, 1938.*

[2] *Charlotte Buehler, The Mental Development of the Child, New York, Harcourt Brace, 1930.*

[3] *Mary M. Shirley, The First Two Years, Minneapolis, University of Minnesota Press, 1933.*

[4] *Eva A. Fillmore, Iowa Tests for Young Children, Iowa City, University of Iowa Studies in Child Welfare, 1936.*

[5] *Psyche Cattell, The Measurement of Intelligence of Infants and Young Children. (Revised.) New York, The Psychological Corporation, 1942.*

CHILD DEVELOPMENT, Vol. 14, No. 3 (September, 1943)

devised and added to the other items to complete the battery.

Two criteria were used in selecting the test items: 1) Objectivity in giving and scoring; and 2) Suitability as a measure of adaptability rather than of physical structure or reflexes. In the first form of the test battery the second criterion had to be interpreted very liberally but it has formed one of the principal bases for later tests.

Certain other criteria which could operate only after a test item had been administered for some time also determined the inclusion or rejection of test item. Each item should show: 1) Age progression i.e., younger infants should be unable to pass an item which older children should be able to pass, or, as is more often the case, progress in mastery of more difficult stages of an item of the test should parallel age progress; 2) Variability of success at any one age level, i.e., not all children at a given age should be expected to pass an item (if approximately 75 per cent of the infants of the same age can succeed with an item it is considered correctly placed); 3) Agreement of each item with the total score on the test, i.e., internal consistency of the items composing the test, and 4) most important of all, Correlation with I.Q's secured later from other standard tests.

Based upon the first two criteria previously mentioned, a battery of 32 tests was assembled. About one-third of these were new, another one-third were adaptations of other tests and the rest were taken directly as used by previous investigators. The tests were administered weekly. In most cases the testing was begun when the child was one week of age and continued until the end of the twelfth week. No test was given more than one day removed from this schedule. Thus the interval between two successive tests was generally seven days and never fewer than six nor more than eight.

Thirty-one children were given this battery of tests. Ten other children were given the tests beginning at the seventh week and ending at the twelfth week.

The following is a brief description of the tests and methods of scoring them. This list is to be considered a very tentative battery. In successive revisions many of these test items will be discarded, others will be revised, and new items will be added.

1. Visual Regard (small silvered folding metal tape).[6] Pull out about 14 inches of tape, hold it by the pulled-out end and bring round case within the baby's line of vision about ten

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[6] *Materials indicated in parentheses for this and succeeding tests.*

inches from the face. If the baby does not immediately fixate the tape, make several attempts to get it to do so. As soon as fixation occurs, move the tape horizontally from one side of the baby's crib to the other and note if the baby follows it continuously with its eyes. If the baby is able to follow horizontally even a short distance, proceed to move the tape vertically, about the same distance above as below the baby's eyes and again note whether it follows the tape. If it does then move the tape circularly at a radius of about ten inches from the baby's nose and again give credit if the baby follows continuously. (See Table 1.)

2. Flashlight (a small pencil type flashlight). Hold the flashlight about two inches from the baby's eye. Flash it momentarily in one eye and then the other. Credit is given if the child in each case blinks or averts its eyes.

3. Knee-pinch. With the baby's legs in a semi-flexed position, briskly pinch the inside, fleshy part of one knee, then the other, then both at the same time. Credit if a definite withdrawal reaction occurs. (See Table 2.)

4. Cheek-touch. Place the forefinger at the right corner of the baby's mouth and let it remain there for several seconds, then repeat for the left corner. Credit if the head is turned toward the finger.

5. Cheek-tap. With the ball of the forefinger, tap briskly several times the fleshy part of the baby's right cheek, then tap the left cheek in the same manner. Credit if the baby protrudes the lips simulating sucking movements.

6. Eyelid-touch. Place the forefinger lightly on the lid of the baby's right eye; then repeat for the left eye. Credit if the eye is tightly closed to finger.

7. Lip-stroke. Move the forefinger lightly from side to side on the baby's upper lip and repeat for the lower lip. Credit if sucking movements occur.

8. Alcohol on Abdomen (rubbing alcohol and cotton swab). Saturate an applicator with alcohol and apply it with one swift stroke to the baby's abdomen a little to one side of its navel. Credit if there is a definite withdrawal of abdomen.

9. Block on Chest (small play block slightly over one inch square). Place the block on the baby's bare chest and leave it there for five seconds. Credit if there is some movement to remove the block.

10. Hand Threat to Eyes. With the baby lying in a supine position and with eyes open bring the open palm with the flat side held parallel to the front of the baby's face quickly to within about one inch of the baby's eyes. Credit if there is a definite wincing movement.

11. Dangling Ring (ordinary embroidery ring about three

TABLE 1

TEST OF VISUAL REGARD

NUMBER OF RESPONSES OF EACH TYPE FOR 11 INFANTS IN 12 WEEKS

	Stares Vacantly	Fixates Objects	Follows Horizontally	Follows Vertically	Follows Circularly
12					11
11		2			9
10					11
9					11
8			2	2	7
7			1	1	9
6		1	3	2	5
5		3	2	1	5
4		8	2	1	
3		5	5	1	
2	10			1	
1	10	1			

TABLE 2

RESPONSE TO FLASHLIGHT

RECORD OF 18 INFANTS FROM 3 TO 12 WEEKS

	No Response	Averts Eyes	Delayed Closing	Prompt Closing
12		1	1	16
11		1	1	16
10		5	1	12
9		3	1	14
8		1	2	15
7		4	2	12
6		4	3	11
5		4	1	13
4		2	3	13
3		1	4	13
2		Tests Not Given Regularly for		
1		First Two Weeks		

inches in diameter attached to a short string). Holding the ring by the free end of the string, bring the ring slowly within the baby's line of vision to a point about six inches above its chest and allow the ring to dangle but not twirl for about 30 seconds. Credit if the baby makes a definite attempt to reach the ring or at least makes vigorous movements of hands or legs.

___12. Closes Fingers on Ring (a rattle may be substituted for ring). Bring ring in contact with the palmer tip of baby's fingers. Credit if child opens hands at contact with ring within three seconds. Further credit if child closes hand about the ring with thumb opposing fingers.

13. Paper on Face (a 10-inch square of transparent cellophane paper). Place the paper on the baby's face and allow it to remain there for 10 seconds. Credit is given if child sticks out tongue, turns head to side or strikes paper. No credit for crying or for not reacting.

14. Crumpled Paper. At close of test 13 remove cellophane paper and quickly crumple paper about three inches from the baby's ear. Credit if child shows startle reaction.

15. Pain Stimulation (ordinary blood sampling instrument). Adjust the instrument so that it will penetrate both layers of the baby's skin. Place the instrument against the forefinger and release the spring. Credit if there is a definite withdrawal to pain stimulus.

16. Music Box (a toy music box which plays a short tune by turning a crank). Hold the music box about four inches from the baby's right ear and play the entire melody at the correct tempo. Repeat for the left ear. Credit if there is a noticeable diminution or cessation of activity to the sound of the music either time it is played.

17. Bell-ringing (an electric doorbell placed in a box 3x4x10 inches with a one and one-half volt dry battery and a push button). Place the bell five inches back of and five inches above the baby's head without attracting its attention to the bell. Ring the bell once giving a loud, clear tone for slightly over one second. Credit if the child blinks, distorts mouth, wrinkles forehead, starts, or cries.

18. Restraint of Arms. Whenever the baby is engaged in crying or in waving its arms or legs press its two arms closely and firmly in extended position to its sides for five seconds. Credit if the child makes vigorous reactions against restraint.

19. Standing Position. With the baby facing the examiner, the examiner lifts it with a well distributed grasp under each ampulla and lowers it to a standing position, allowing the soles of the feet to contact the bed. If the child manifests any extension of the legs upon contact with the bed, release its support gradu-

ally to determine how much weight it will support. Credit if child shows definite signs of partial support of weight.

20. Pulled Toward Sitting Position. With the baby lying in a supine position take hold of its hands and after two or three gentle pulls exert a gentle but firm pull until the baby is raised to a 45 degree angle. Care must be exercised not to continue the pull if head lag is complete. Credit if there is no noticeable head lag, i.e., if head is raised with the body.

21. Sitting Position. Continue to pull baby to sitting position if there is no serious head lag in previous test. Credit if child holds its head erect for two or three seconds unsupported.

22. Rearing Head from Prone Position. Place baby in prone position and adjust the arms so that they are close to the sides of the body and the elbows bent with hands near the face. Note whether the child raises its head from the blanket. Credit is given if head is raised from blanket (zone 1). Additional credit is given if the head is raised between 45 and 90 degrees (zone 2). Further credit is given if the head is lifted more than 90 degrees and the arms help support its weight (zone 3).

23. Attends to Examiner. The examiner bends over within about 12 inches of the child's face and looks at it. Credit is given if the child gazes into the examiner's eyes for at least two seconds.

24. Listens to Voice. The examiner recites a poem such as ''Mary had a Little Lamb'' in a normal voice but with much inflection and expression. Credit if child gives clear evidence of listening. Further credit is given if the child babbles or ''talks back.''

25. Follow number 24 with a sudden change of voice, speaking with a growl. Credit if child winces, blinks, suddenly moves about, distorts mouth, or cries.

26. Laughs Aloud. Play with child and note any vocalization during any part of the testing. Credit is given if at any time the child laughs out loud.

27. Imitates Facial Movements. With the experimenter's face close to the baby's eyes purse lips then broaden them several times. Credit if the child makes any attempt to ''imitate'' these movements.

28. Follows Moving Person. While the baby is lying supine, the experimenter moves around in easy view of child. Credit if the child follows experimenter with its eyes.

29. Makes Searching Head Movements. Experimenter hidden from the baby shakes a rattle 18 inches from child, but out of its field of vision. Credit is given if child turns head even if the glance remains straight ahead.

30. Moves Head in Escape. The experimenter cleans child's nose with wad of cotton. Credit is given if child turns head or makes definite escape movements.

31. Changes Reaction to Repeated Auditory Stimulus (frog sounder). Click the sounder continuously for 15 seconds. Repeat for a total of six trials with 30 second intervals between. Credit if the child starts at the first series but becomes negatively adapted before the series is completed.

32. Changes Expression Upon Seeing Mask (a rabbit's head mask). The experimenter smiles at the baby for 30 seconds and then puts the mask on. Credit is given if the child visibly changes expression upon seeing the mask.

One important precaution that has too often been neglected in the literature and no doubt in experimental technique, should be mentioned concerning the administration of tests to infants. It is generally recognized that rapport is necessary in giving tests to adults. While it is not to be gained in the same way, rapport is none the less important in giving tests to babies. Tests should be administered from about 20 minutes to one hour after regular feedings. The child should be dry and awake - it may be aroused if necessary - and should not be crying. If persistent crying occurs during the testing the tests should be discontinued and continued later.

In addition to the problem of the construction, giving and scoring of the tests, there remain the validation and standardization of norms. Four methods have already been set forth for validating test items as well as the whole battery of tests. The one of these that is now being investigated is age progression. In order to study age progression a test such as that presented in Table 1 was constructed for each test item. This table shows a regular progression from the simple to the more difficult parts of the test. In another test (see Table 2) there was little or no progress with age. While progress is not necessarily evidence of growing mentality, as is shown by the fact that physical growth shows progress but is not highly correlated with intelligence, there is much more likelihood that increased adaptability to a test situation is evidence of mental growth.

Note is also taken of the regularity of success or failure on a test. While this is related to the first criterion it is somewhat different. Better test items are those in which there was consistent success after the first.

Variability on a test is shown in Table 1, for example, for the sixth week. One infant only fixated the tape, three followed horizontally, two vertically, and five circularly.

The fourth criterion of validity will have to be deferred until the infants are old enough to be tested by other tests such as those of Cattell and later by the Stanford Revision of the Binet. All the children who have been placed in the Chicago area and whose foster parents will cooperate are being tested at six months, one year, two years, three years, and possibly longer. An insufficient number of infants have been tested to date to justify the presentation of correlations, but a distinct relationship is already apparent with Cattell scores for six months and one year.

Upon the bases of the preceding methods of validation and the age at which items of the test were passed by approximately 75 per cent of the infants, a tentative battery of tests was assembled for ages 4 weeks, 8 weeks, and 12 weeks. Some items from the original battery were eliminated, many others were separated into several parts, and a few new tests were added. The following list shows the items in each battery. There is some overlapping of items in the three batteries.

4 weeks: first 11 items are given with child in supine position (necessary apparatus indicated in parentheses)

1. Listens to Voice
2. Focuses on Object (metal tape)
3. Follows Tape Horizontally (metal tape)
4. Blinks or Averts Eyes (flashlight)
5. Closes Eyelids at Touch
6. Moves Abdomen at Touch of Alcohol (alcohol and applicator)
7. Reacts to Pain Stimulus (blood-sample instrument)
8. Opens Hands at Touch of Rattle (rattle or ring)
9. Closes Fingers about Rattle (rattle)
10. Diminishes or Ceases Activity at Sound of Music (music box)
11. Startles at Loud Sound (door bell)
12. Lifts Head to Zone 1
13. Lifts Head to Zone 2
14. Compensates Head When Pulled to Sitting Position
15. Holds Head Erect Momentarily

8 weeks: first 15 items are given with child in supine position

1. Responds to Adult's Glance
2. Listens to Voice
3. Babbles
4. Follows Moving Person

5. Focuses on Object (metal tape)
6. Follows Tape Horizontally (metal tape)
7. Follows Tape Vertically (metal tape)
8. Follows Tape circularly (metal tape)
9. Holds Ring with Thumb Assisting (embroidery ring)
10. Makes Searching Head Movements (rattle)
11. Investigates Paper on Face (cellophane paper)
12. Reacts to Crumpling of Paper (cellophane paper)
13. Moves Head in Flight Movement (cotton applicator)
14. Reacts to Ringing of Bell (door bell)
15. Reacts to Changing Tone of Voice
16. Lifts Head to Zone 2
17. Lifts Head to Zone 3
18. Compensates Head When Pulled to Sitting Position
19. Holds Head Erect

12 weeks: first 11 items given in supine position; items 14, 15, 16, and 18 in sitting position

1. Anticipates Feeding
2. Returns Glance with Smiling or Cooing
3. Imitates Facial Movements
4. Follows Tape Circularly (metal tape)
5. Increases Activity at Dangling Ring (embroidery ring)
6. Moves Head in Flight Movement (cotton applicator)
7. Reacts to Disappearance of Face
8. Looks for Source of Sound (rattle)
9. Changes Reaction to Repeated Auditory Stimulus (frog sounder)
10. Changes Expression upon Seeing Mask (rabbit's head mask)
11. Feels an Object (cardboard)
12. Lifts Head to Zone 2
13. Lifts Head to Zone 3
14. Regards Cube (red cube)
15. Regards Spoon (spoon)
16. Discriminates Milk and Water (two bottles)
17. Inspects Fingers
18. Holds Head Steady
19. Laughs Aloud

This new series of tests was given to 37 babies four weeks of age, 38 eight weeks of age, and 19 twelve weeks of age. In giving these tests both the four and eight week tests were given to the four week babies, the eight and twelve week tests to the eight week babies, but only the twelve week tests to the twelve week babies.

Table 3 gives the mean percentage of items in each battery passed at each age. Assuming the babies tested to be a normal group - and the Cattell scores indicate that this is true - these may be considered as very tentative norms for these ages.

TABLE 3

MEAN PERCENTILES OF TEST PASSED AT EACH AGE

Age of Child When Tested	4 Wks.		8 Wks.		12 Wks.
Test Battery Used	4 Wk.	8 Wk.	8 Wk.	12 Wk.	12 Wk.
Mean Percentile Score	67	42	66	38	54

Twenty-four infants were tested at four weeks and again at eight weeks. As described above, two batteries of tests were used at each age. The correlation between the four weeks and the eight weeks battery when given at the same time was .57. When corrected by the Spearman-Brown formula this correlation was increased to .72. This may be considered as a rough reliability coefficient. The correlation between the eight and twelve weeks battery when given at the same time was .66 and when corrected became .80. These, of course, were small groups of children and the probable errors were .07 and .05 respectively.

The correlation between both batteries given at four weeks and the batteries given at eight weeks was .47. While this is not a high correlation it must be recalled that the infants had doubled their ages during this interval. It remains to be determined whether Bayley's contention that there is little correlation between early test scores on infant tests and later test scores holds true in this investigation. It might not hold true if different tests were used as is the case in the present study.

Summary and Conclusions

As further study continues for improving the tests of infant mentality two different methods of test construction are being compared. In one form of the tests we are combining the items into batteries for different ages as in the Binet tests and as we did in the latter part of the study reported here. In another study, which is being conducted by Professor and Mrs. Morgan, the test items are being combined into one test battery and developmental norms are being established. As yet it is impossible to determine which method will prove the most useful.

But whatever method of test construction is finally adopted, the evidence thus far collected strongly suggests that it will be possible to construct a test or a collection of tests that will possess considerable validity and reliability. However, it is likely that, because of the variability of the responses of a baby, any test will have to be administered more than once in order to assure a representative sample of the baby's performance. If a sufficient number of good test items can be administered on several occasions our results suggest that a test of much practical value is possible.

The authors during the time when the tests described here were being given were able to determine low grade ability in three babies under three months of age, the diagnosis being later verified by other standardized tests of intelligence. If infant tests can do no more than separate those with limited capacity from the normals they will be of inestimable value in helping with the placement of babies for adoption, and we will have accomplished one more step in the construction of accurate measures of mental development for that period of life in which its rate is relatively the most rapid.

INFLUENCES OF WAR AS EVIDENCED IN CHILDREN'S PLAY

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Introduction

War has added many new aspects to the environment of children in Hawaii. For this reason the following study has been undertaken to determine how these new influences are reflected in children's play. The specific purpose of this study is not to prove or disprove any preconceived theories, but merely to present a descriptive account of children's play as it appears to be influenced by war and local conditions directly and indirectly related to war.

Justifications for this study might be considered as being threefold. First, Hawaii was the focal point of the major attack which precipitated the declaration of war by the United States and since that attack has constantly been a theater of war. Thus many new psychological characteristics have been added to its environment which make it different from any other part of the United States or its territories. Likewise, the specific role played by Pearl Harbor in war propaganda has added to Hawaii's psychological complexity. Quite unrelated to the war, Hawaii presents a unique situation from a social standpoint by virtue of its mixed racial population. The fact that people of Japanese ancestry and peoples descended from other racial groups now at war with Japan comprise a large per cent of the population has presented many new psycho-socio problems. These facts, which are specific to Hawaii, afford an opportunity for study comparable to no other environmental situation.

A second justification for a descriptive study of this kind is the knowledge which its data might contribute in orienting children in present day culture. For example, there has been considerable discussion as to whether or not an attempt should be made to give children an understanding of the meaning of

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[1] *The authors wish to acknowledge the contributions to this study made by the teachers of the Free Kindergarten and Children's Aid Association and the teachers of the pre-schools of the Church of the Crossroads and Central Union Church.*

war, and if so how this could best be done. Some have felt that all discussion of war by adults in the presence of children and manifestations of war interest by children should be suppressed, while others have taken a more liberal view. Many of the latter have raised the question as to whether or not children's war play might be guided so as to lead to positive values. The answers to these questions can only come as a result of learning what meaning war has for children and to what extent it affects their behavior. Although a descriptive account of children's play as it reflects war can give us no definite answers of statistical value, it may suggest trends and indicate the direction for further research.

A third justification for this study is the light which it might throw on the problem of what effects children's awareness of war have on personality and social relationships. This problem raises two specific questions. First, does children's awareness of war stimuli and participation in war play tend to increase emotional instability? Second, do war influences have any effect on the development of positive character traits? It has been the contention of some that war is not entirely destructive in nature, but that it also has positive and humane phases and that an understanding of these may have an influence on the development of positive character traits in children. Here again it will be impossible to draw any definite conclusions from a purely descriptive study on such far-reaching questions as are presented by the whole problem of character and personality. Nevertheless, it is possible to observe within limits to what extent war play is accompanied by such emotions and impulses as fear, anger, hate, destructiveness, and hostility, and how frequently children dramatize the more positive and humane aspects of war such as the administration of first aid and various defense measures.

General Method

The following study is limited to data gathered six months or more after the attack on Pearl Harbor from eleven kindergartens under the direction of the Free Kindergarten and Children's Aid Association and two church preschool groups in Honolulu.[2] The kindergarten groups take the place in Honolulu of public school kindergartens in other localities. The ages of the children ranged from 3 to 6 years, the large majority being four- and five-year-olds. The children may be said to be a

[2] *Throughout the study the Free Kindergarten and Children's Aid Association groups will be referred to as kindergarten groups, and the church preschool groups as church groups.*

representative group of kindergarten children none of whom as far as is known has suffered any undue hardship as a result of the war.

TABLE 1

PERCENTAGE OF VARIOUS RACES REPRESENTED IN THE KINDERGARTEN AND CHURCH GROUPS AS COMPARED WITH THE 1940 CENSUS FIGURES FOR ALL HONOLULU CHILDREN UNDER FIVE YEARS OF AGE

	Hawaiian	Part Hawaiian	Caucasian	Chinese	Japanese	Filipino	Korean	Porto Rican Negro Others
Honolulu children Under five years	2.1	26.4	21.2	10.2	31.1	4.3	1.5	2.8
Kindergarten and church groups	4.5	10.3	12.6	12.4	48.4	6.3	1.3	3.1

Table 1 shows the racial composition of the groups studied as compared with the 1940 census figures for all Honolulu children under 5 years of age. It will be noted from the table that in general the racial distribution of the groups studied is similar to that of pre-war Honolulu's general population of pre-school age children although the percentage of Japanese is somewhat higher and the percentage of Caucasians and Part-Hawaiians somewhat lower.

The data for this study were gathered from three sources; material obtained from observations, a collection of children's paintings, and teachers' responses to questionnaires. A series of 24 one-hour observations were made by the authors over a six weeks period in two of the kindergarten groups, each observer making twelve observations in one group. With this method of having only one observer in each kindergarten, it was impossible to observe the entire group. For this reason an effort was made to observe children engaged in war play. As far as possible a diary type of record was kept. Since it was difficult to observe painting directly and at the same time obtain data on other activities of the children, a plan was arranged to have teachers in three kindergarten groups observe and collect all paintings done by children over a period of two weeks. (This period was at a later date than the original observation period.) The schools chosen for this purpose were selected purely on the basis of convenience. Teachers were instructed not to ask the child what his painting was about, but to record any verbalization during the painting and to give the child an opportunity to comment on his painting if he so desired.

Questionnaires which were given to teachers of all groups referred to: 1) Manifestations of war influences in various play activities; 2) the extent to which war play takes place and proportion of children participating; 3) participation in war play in relation to sex, race, and home background; 4) the initiating, terminating and over-stimulating circumstances of active dramatic war play; 5) participation in war play in relation to social, emotional, and personality factors. (See sample in appendix.) Teachers were asked to make observations over a two-week period, on the basis of which they would then fill out the questionnaire. The teachers to whom the questionnaires were issued are of different racial backgrounds, a large proportion being Japanese. There are also wide differences in the educational backgrounds of these teachers. Due to these facts it is possible that in a few instances prejudice and preconceived opinion may have prevented accurate reports.

All data were analyzed and summarized by the authors and are presented in the following discussion. In general the data from the three sources will be presented separately, but as far as possible the observational data will be discussed in relation to the questionnaires so that comparative interpretations and evaluations may be made.

Manifestations of War Influences in Various Play Activities

In a study of how war influences are evidenced in children's play the first questions that present themselves are: Does war play take place among kindergarten children? In what activities may the influences of war be observed? Is war play limited merely to using models of war[3] for creative endeavor or is there actual dramatic war play?

In the two observation groups both observers noted some evidence of war play during all observation periods with the exception of one. The failure to note any during this one period may be due to the fact that this was the beginning of a new term and there were a number of new children in this group. The teacher reported that there had previously been much interest in war play. In all other observation periods some evidence of war play was noted. The reports of teachers on the questionnaires agreed substantially with the observational data on occurrence of war play, all teachers reporting some evidence of war play in their groups.

[3] *The term models of war is used throughout the study and refers to the making of guns, planes, ships, etc., in creative work.*

The data from both the observation groups and reports of teachers indicated evidence of war influences in painting and drawing, clay modeling, block building, and dramatic play. Teachers in ten of the thirteen schools reported seeing war influences in each of these four activities, and all schools reported manifestation of war in block building. Influences of war were observed primarily in clay modeling in one group and in block building in the other. It should be pointed out that data from both observation groups as well as the questionnaires indicated not merely the using of models of war for creative endeavor, but also participation in active dramatic play.

Little data could be obtained on painting and drawing in the two observation groups. However, the responses of teachers on questionnaires, as well as the special collection of paintings, indicated considerable influence of war manifested in painting and drawing. Teachers reported that the drawings and paintings most frequently depicted armaments such as airplanes, submarines, guns, army trucks, and parachutes. They also reported a number of drawings of symbols such as flags, swastikas, and victory symbols, and a few instances of camouflage and defense measures such as blackout and bomb shelters. In one instance the expression of an abstract idea was seen in a drawing where the paper was divided into four squares representing England, America, Germany, and France with walls between to keep them from fighting.

The data obtained from the special collection of paintings presented facts of some statistical interest. In this collection a total of 173 paintings were made by 94 children. Of these, 26 or 15 per cent of the total number of paintings depicted war. This was obvious both from the observation of the paintings and the comments made by the children while painting. Here again the majority of pictures depicted armaments and symbols. In addition there were two instances depicting blackouts. Several of the paintings were quite complex and the comments made by children about these paintings expressed ideational concepts involving conflict between nations. For example, one child describing his painting said, "This is America! This is Japan! Bomb Tokyo!" In many of the paintings keen observation on the part of the child was apparent from the amount of detail included in the painting. One child painted a picture of a seaplane with accurately placed propeller, pontoon, rudder, and machine gun. Although the war theme was prominent in the paintings of some children it was not an exclusive interest and did not even always predominate. Also it should be mentioned that in spite of the war interest there nevertheless appeared to be a great deal of pleasure in painting for its own sake and joy in the use of line and color. There appeared to be no significant difference in the colors used or in the quality of line in the war paintings as compared with other paintings. It is possible that this may signify the lack of any characteristic emotional tone associated with war paintings.

War influences in clay work were represented in the two observation groups primarily in the modeling of armaments such as airplanes, ships, submarines, airplane carriers, machine gun nests, and bombs. A common activity noted in one of the observation groups was building an airplane and then loading it with bombs. There was a good deal of interest in detail in modeling and the models were often named with frequent reference to P40 and B19. It was also noted that symbols appeared in clay modeling. For example, one boy made an airplane putting a V on one wing and U.S.A. on the other, while a V...- was modeled by another boy. It was observed that this creative endeavor was frequently accompanied by the singing of patriotic songs, particularly "Anchors Aweigh."

As was true in the two observation groups, the reports of teachers also indicated that war influences were represented in clay modeling chiefly in the creation of armaments and war symbols. In addition teachers reported frequent representation of defense measures such as the modeling of bomb shelters, gas masks, and tires. The modeling of tires was noted at the time of the drive for old rubber. In several instances teachers also reported noting the modeling of human figures. For example, one child modeled a man's face, labeling it Hitler.

Both the observational and questionnaire data indicated that the creation of war models in clay work frequently led to active war play. This was not true of painting, which is likely due to the difference in the creative medium. In spite of the fact that the completion of models in clay work frequently led to active war play, it was nevertheless apparent that there was a good deal of joy in modeling for its own sake and an interest in detail and perfection. In other words, the normal values of the activity seemed to be retained regardless of the stimuli initiating the activity and the type of play to which it leads.

In block building, as in clay modeling, war influences were represented primarily in the construction of models of war. These models were similar to those found in clay work, being chiefly armaments of various kinds. Those most frequently noted in the two observation groups were battleships with gun turrets, airplanes, forts and gun emplacements. There were also some instances noted of building models related to positive phases of war such as hospitals, stretchers, and first aid stations. The reports of teachers indicated the same manifestations of war interests in block building as were noted in the two observation groups. In addition, teachers reported several instances of building models related to defense measures such as bomb shelters. It is interesting that building armaments and other models of war were reported in every school with the exception of one which happened to be one of the church groups.

As was true in clay modeling, it was noted from both the observation and questionnaire data that the completion of models of war in block building frequently led to active war play. Often, however, there was a return to construction with an interest in detail and perfection. For example, in building a battleship great care was used in constructing the hull with a double row of blocks and completing the entire deck by fitting small blocks together closely, this being a very laborious piece of construction meticulously done. Interest in construction for its own sake was also shown in the work of a group of boys who were making a tower for a gun emplacement using a long stick over a block in a fulcrum and lever fashion with which they were raising the building by adding blocks underneath instead of on top. Thus, as in painting and clay work, it is apparent that although war stimuli affect the activity of block building, the normal interests of construction are nevertheless present.

Influences of war in children's play were probably most frequently observed in active dramatic war play. This war play for the most part grew out of other activities such as completion of models in clay work and block building. For example, James having modeled a plane out of clay started flying it, at the same time humming the noise of the engine and saying "B19 diving down now! Drop bomb now!" He then dropped the bomb on the plane which the girl next to him had made. Another group of boys, building a fort with blocks, put machine guns around the sides. They then sat inside the fort aiming the guns at two boys across the room who had built a tower. This action was accompanied by the rat-tat-tat of machine guns.

In some instances the war play was merely the imaginative play of a single child. For example, in clay modeling there were numerous instances where a child after completing a plane would fly it through the air humming the noise of the engine and finally crash it on the table. Day after day one boy built a tower of blocks and after completing it would march up and down in front of it occasionally stopping to salute. This was accompanied by the singing of a tune which was definitely recognizable as martial music.

In other instances the war play was well organized group play. This type of play seemed to predominate in play with blocks usually involving a group of three or more children or several such groups. There also was usually some evidence of leadership. In some instances the play was clearly organized with definite sides opposing each other while in other instances the organization was much less clearly defined. In these instances children would point their guns at or engage in hand to hand combat with whomever happened to be near by. An example of the more clearly organized play may be seen in the following. Under the direction of one boy a group of boys built three seaplanes. James, the pilot of one plane, said while making the noise of a machine gun and pointing his gun at Clifford and John in the other plane, "I shoot those planes," Clifford and John then began shooting at James. James said to his co-pilot, "Look! Help!" With this James and his partner took their guns, went over to the boys and started hand to hand combat.

The nature of the war play in general was usually some form of combat such as machine gunning, dive bombing, torpedoing, sniping, and commando tactics. The play was for the most part quite realistic with clear dramatization of the more sadistic phases and the use of facial expression and bodily action depicting suffering and death. This is shown very clearly in the following episode. Moses, in the manner of a commando, made a raid on John's fort, pointing a gun at him and shouting, "Bang!" John, putting his hand over his heart and expressing agony in his face, grabbed his gun and shot back at Moses, who fell "dead". Although the play was realistic, it never went beyond the realm of play, and there were never evidenced any hostile feelings or actual attempts to hurt one another. In many instances boys were seen to pretend to be throwing blocks as hand grenades, but no one ever actually threw one. Also they frequently pointed sticks as bayonets, coming very close to one another, but not actually poking. In all play an atmosphere of gaiety and laughter prevailed, and although the opposite side was frequently referred to as the enemy, a friendly and playful attitude was apparent throughout.

Although the primary emphasis in war play appeared to be on the more aggressive phases of combat, dramatizations of other aspects of war such as communications, defense measures, first aid, and rescue work were also observed. Dramatizations of communications were seen in several instances where a boy would use a block as a microphone. For example, one boy pretending to be piloting a plane communicated in this fashion saying, "I'm coming down America! Dive bomber coming down now!" In another instance a boy who was acting as sentry at a watch tower using his "microphone" in a voice imitating the radio police calls, repeated several times "Get the emergency doctor."

Certain defense measures were also portrayed in war play, particularly with reference to air raid alarms. In the midst of dramatic play centered around the construction of a ship one boy making the noise of a siren suddenly jumped up and shouted, in exact imitation of the announcement made over the radio during actual alarms, "This is an air raid alarm! Take cover!" It is interesting that an actual alarm with such an announcement had not occurred for several months.

Portrayals of first aid and rescue work were seen in instances where a child pretending to be injured in combat play would be carried to a hospital bed. In other instances a child would be rescued from the battlefield and dragged back to the fort.

The reports of teachers in regard to the influences of war as portrayed in active dramatic play agreed substantially with the observational data. As was noted in the two observation groups, it was reported by the teachers that much of the active dramatic war play followed as a result of the completion of war models in block building and clay work. Teachers reported combat play as the type most frequently observed, and also noted many instances of well organized group play. An interesting example given by one teacher tells of two groups of children shooting at each other from forts. One group rushed over to the opposing fort and destroyed it, after which one of the boys stood on the ruins shouting, "America wins!" Teachers' reports indicated that the positive phases of war were also brought out in the dramatization of first aid. Several other types of war play were mentioned by the teachers such as marching, bomber formation, and dying.

In the two observation groups it was possible to note some general characteristics of the war play which could not be obtained from the questionnaire data. In general all dramatic war play was characterized by a child-like transitory quality. For example, in the middle of well-organized group war play there would be a temporary shift to Superman, the Lone Ranger, or other popular types of child play. This transitory quality was not only seen in relation to the subject of the play but also in relation to the organization of the play. For example, Richard, Donald, and Jerry were shooting from forts at Warren and James who were crouching behind a tower on the opposite side. In the midst of the play Warren called to Donald, "Hey, I like be on your side." James said, "Me too!" and they both picked up their towers and put them inside Donald's fort. With this Donald, Richard, and Jerry went to the opposite side and the combat continued again.

Although there was organization in much of the war play in the sense that there was cooperation among members of a group and inter-group play, there was little continuity to the play such as one finds in a well-developed project type of play. In contrast to the latter, the play consisted of a series of separate episodes of short duration without reference to a specific goal and linked only by the general ideology, desire for activity for its own sake, and a certain type of emotional and bodily expression.

However, with teacher guidance it is possible to direct war play into a well-developed project type of play. This may be seen in an activity reported by a teacher in one of the observation groups. This activity lasted throughout the last two weeks of the school session immediately following the six weeks in which the observations were made. During the first six weeks a great deal of active dramatic war play had centered around the blocks. On one occasion a child was accidentally hurt, and the teacher's suggestion that he might need first aid interested two boys in making a first aid station out of the building which had been a fort. They lacked knowledge of what was needed, so the teacher arranged an excursion taking four boys and two girls to the nearby O.C.D. First Aid Station. They noted particularly the first aid signs, medical insignia, the way the attendants carried the stretchers and what equipment was ready for use by the nurses. Back in their own play room they immediately began making signs, doctor's kits, nurse's uniforms, and bandages.

After working awhile on the first aid station the boys again began active combat play, bringing the "wounded" into the first aid station where the girls were acting as nurses. As the play became rough the teacher had a discussion with the boys about shooting near the first aid station, and it was decided to use the opposite end of the room for a fort. A squad of ambulance drivers used a board for a stretcher, put it on a cart, and wheeled the "wounded" into the first aid station. Here the "nurses" gave first aid, helping some to walk with crutches. In the midst of this play one boy noticed that the sign over the first aid station was the air raid warden insignia, rather than a first aid sign. At the teacher's suggestion a group of five children took crayons and paper and went to the O.C.D. First Aid Station again to make a copy of the insignia. They then put these drawings on their first aid station and ambulances. The above play lasted over the full two-week period and was terminated by the end of the school session. This incident shows how a teacher, who was alert to needs arising in the group, helped the children find the necessary information to progress to desired goals in their activity. Although most of the war play observed was not of this high level of organization, the above example shows that with teacher guidance much of the war play might be directed along lines which might lead to higher educational values.

The Extent to Which War Play Takes Place and Proportion of Children Participating

A second consideration in a study of war influences as evidenced in children's play is the extent to which war play appears and the proportion of children who participate. War play occurred extensively in the play of the kindergarten children. This is indicated in a statement made previously that in both observation groups influences of war in children's play were seen during each observation period, with the exception of one. In most instances this war play continued throughout the entire period. On those occasions when it was of short duration it was found that the leader of the group was absent or that the general routine of the school was upset. Since these observations were made during the free play period only it was not possible to observe to what extent war play occurred during the rest of the school day. The data from both observation groups agreed that the majority of boys participate in active dramatic war play at some time. A few of the less aggressive boys were never seen to participate but were sometimes seen to observe the war play or to take part in an imitative way on the sidelines. Only a few girls were seen to take part in active dramatic war play and these few were of the more aggressive type.

The data from teachers' reports on the questionnaires agreed fundamentally with the above findings on the two observation groups. War play was evidenced daily in every school with the exception of one which happened to be one of the church groups. Also all schools with the exception of this same church group reported that war play usually continued throughout the entire free play period. Nine of the thirteen schools mentioned seeing war play or evidence of war influences not only during the free play period but also at other times of the day in conversation periods, during lunch, in rhythms, etc. In regard to the proportion of children participating in war play, the findings from the reports of teachers agreed with those from the observation groups that the majority of boys at some time participated in war play but that some children were never seen to participate and that these for the most part were girls or timid boys.

Participation in War Play in Relation to Sex, Race, and Home Background

A third group of factors which was investigated concerns the relationship between participation in war play and sex, race, and home background. In the two observation groups it was noted that boys participated much more frequently than girls in the creation of war models in clay work and block building and in active dramatic war play. In many instances where boys were creating war models or engaged in war play girls were present but showed no interest in the war projects and continued making things related to housekeeping play such as houses, beds, dishes, etc. For example, in one instance a group of girls was playing with blocks together with a group of boys who were building forts. Although the structures were similar the girls called theirs houses. In another instance a group of girls was playing in the doll house when some boys came in and started shooting out of the windows. The girls, instead of entering into the war play, got out of the boys' way and went on with their doll play. In both observation groups there were only three instances noted where girls participated in war play. It should be remembered, however, that painting and drawing were not observed in these two groups.

In the matter of sex differences, the collection of paintings showed similar findings to those noted in clay modeling and block building, that war interests are much more marked among boys than girls. Forty-six per cent of the boys as compared with 8 per cent of the girls painted war pictures. Sixty-six per cent of the boys' war paintings concerned armaments while none of the girls' war paintings depicted armaments. The girls' war paintings concerned other aspects of war such as flags, symbols, and blackout.

In general, the results from teachers' questionnaires agreed with the observational data that in all activities boys participate in war play much more frequently than girls. However, some interest in war on the part of the girls was reported in clay modeling and block building. In clay modeling the girls, like the boys, primarily made armaments. However, in block building teachers reported that the girls showed more interest in the less aggressive phases of war such as the construction of hospitals, shelters, and so forth, while the chief interest of the boys was in the construction of armaments. One school reported that the girls constructed houses for the boys to bomb. In active dramatic war play teachers reported that in some instances girls were seen to participate but that here again in contrast to the boys' interest in actual combat play, the girls showed an interest in the dramatization of first aid, evacuation, blackout, and air raid drills. In painting and drawing the reports of teachers were in total agreement with the data obtained from the special collection of paintings referred to above.

In regard to the race and home background of children participating in war play, both the observational and questionnaire data reveal no significant relationships. Among a group of twelve children who were noted to be frequent participants in war play many racial backgrounds were represented and no particular race predominated. Only two of these children come from homes where either parent was directly engaged in a war activity. Although teachers in several instances reported that children markedly interested in war play came from homes where one parent worked at Pearl Harbor, no clear relationship between home background and participation in war play was apparent.

The Initiating, Terminating and Over-Stimulating Circumstances of Active Dramatic War Play

Another consideration in children's war play concerns the factors which initiate and terminate it and the circumstances under which it may become over-stimulating. Both the observational and questionnaire data indicate that the most common factor which appeared to initiate war play was the completion of models of war in clay work and block building. In the two observation groups where the war play of a particular group could be observed continuously it was noted that there was a definite carry-over of the war theme from day to day. In block building the original motivating factor seemed to be completion of models of war, but as the play progressed the goal of the activity seemed to shift from construction for its own sake to a specific kind of construction necessary to war play, the construction becoming secondary to the primary goal of war play. In clay work, although the completion of war models often precipitated war play, construction appeared to remain the primary goal. This difference in the two play situations appears to be related to the medium of play, blocks being a material which better lends itself to active war play and which probably is less flexible than clay for the purpose of construction. Other motivating forces which appeared to be important in initiating war play were: The influence of outside stimuli such as planes flying overhead and army maneuvers; the spontaneous aggressiveness of a particular child; and the development of war play as a result of the natural dramatic trend of a play situation. The influence of outside stimuli in initiating war play was seen in an instance where a marked interest in war play coincided with the first day of army maneuvers. However, it is interesting that a routine school air raid drill appeared to have no influence in initiating war play. An example of war play growing out of a normal play situation was seen in an instance where a group of children were playing candy store. As the play progressed the store gradually turned into an ice cream supply department for the air raid shelter, "in case they have to stay all night."

Concerning the termination or interruption of war play, all data indicated parallel factors to those discussed in relation to the initiation of war play. Whereas the completion of war models tends to initiate war play, the destruction of war models tends to terminate or interrupt it. For example, in clay work a child would model an airplane, load it with bombs, fly it, drop the bombs, and finally crash it on the table. With this destruction of the model the war play would terminate and the interest would again return to construction. A second parallel is noted in the influence of outside stimuli such as shifts in school routine and the diverting influence of other activities. A third parallel concerns the factor of aggressiveness. Whereas aggressive direction on the part of a particular child appeared to have a role in initiating war play, aggressive interference appeared important in terminating or interrupting war play. A fourth parallel may be seen in the natural dramatic trend of a play situation where a climax is reached and the play comes to a natural dramatic ending such as the declaration of victory in combat play. In addition to these factors there were two other factors noted which appeared to be important in the termination or interruption of war play, namely, the disapproval of the teacher and the absence of leadership. Although it is probable that leadership tends to initiate war play this becomes apparent only by the fact that absence of leadership tends to terminate or interrupt war play. For example, when a particular child left the play group the play seemed to become disorganized and finally broke up. It was also noted that on several days when this child was absent there was no evidence of organized war play.

It is also interesting to consider some of the factors which tend to make war play highly stimulating and which might lead to over-stimulation. By over-stimulation is meant a level of stimulation which produces in a child or group of children a state of fatigue, uncontrolled behavior, and emotional instability which would prevent them from participating in and enjoying normal activities. Throughout the play in both observation groups many factors were noted which appeared to be making the play highly stimulating. In observing the progress of the play, however, it was noted that in most instances the apparent excitement tended to rise and fall in cycles and that whenever a peak of excitement was reached there appeared to be a natural leveling off. For example, a group of children engaged in combat play were pointing guns at each other and shouting, "Aim!

Fire!" at the same time making the sounds of machine guns and rifle fire. In the midst of this noise and activity one child was shouting, "This is an air raid alarm! Take cover!" The general excitement gradually increased to a climax, after which there was a definite lull, so apparent that one child remarked, "Nobody make noise!" This quiet and decreased activity continued for a few minutes after which the play was again resumed with a gradual rise in excitement, accompanied by loud machine gun firing, shouting and hand to hand combat. This excitement reached a certain level when the noise and activity again subsided. Although the play frequently reached a high peak of excitement in only two instances did it appear to reach a level which could be considered over-stimulating. The direct cause of the over-stimulation seemed traceable in each case to the presence of a particular child who was a disturbing factor in the group and who was reported by the teacher to be a disturbing factor in any group.

Although there were only these two instances of over-stimulation, there were many factors noted, both in the observation groups and from reports of teachers which appeared to increase the level of stimulation. Should a number of these be present at one time and not controlled, over-stimulation might result. This would seem to deserve consideration from the point of view of teacher guidance. The factors most frequently noted as tending to increase stimulation were long duration of play, excessive noise, over-realistic dramatization, the presence of over-aggressive or poorly adjusted children, frustration or teacher interference, fatigue, quarreling and destructiveness, aimless activity, and general lack of supervision. There is, of course, some difficulty in an analysis of this type in distinguishing between the cause and effect of over-stimulation. Actually there is probably no clear distinction between the two for the reason that fatigue or aggressive tendencies resulting from highly stimulating play may become the cause which makes the play over-stimulating.

An example of over-realistic dramatization may be seen in the following: Two groups of boys were firing at each other. One boy grabbed his face and went through very realistic actions and facial contortions as if in pain, finally falling on the floor "dead". Two other boys came over to him and started poking their sticks into him, using them as bayonets. With this the first boy got up and left the group, acting as if he were hurt. In many instances where the children obviously sensed a lack of supervision it was noted that the play tended to become hilarious. In contrast to this it was also noted that when children were frustrated by actual teacher interference there also appeared to be a tendency to hilarity and in some instances destructiveness. Although such factors as these appear to make play highly stimulating and are factors which should be borne in mind by teachers, it nevertheless should be emphasized that in the free spontaneous play of the children observed there were only two instances which were felt by the observers to be actual instances of over-stimulation.

Participation in War Play in Relation to Social, Emotional and Personality Factors

The question of possible over-stimulation discussed above leads us to a consideration of the effect of participation in war play on social and emotional development and its relationship to personality factors. In relation to social development the specific question that comes to mind is, to what extent do children engaged in war play reveal undesirable social attitudes such as race prejudice, autocracy, and hostility. In a situation of this kind where, due to the racial make-up of the population, race prejudice might be expected, it is interesting that in both observation groups not a single instance of race prejudice was noted throughout any of the observation periods. In fact, children of Japanese ancestry constantly played side by side with children of American, Hawaiian, and Chinese ancestry making similar references to the "Japs" as the enemy. The use of the term "Japs" by these children appeared to have no racial significance to them whatsoever but was merely a name for the enemy. It was noted that the Germans were also frequently referred to as the enemy. The reports of teachers on this question agreed on the whole with the observational data, only three schools reporting any evidence of race prejudice and these noting only single instances which were not clearly defined.

One might think that living under war conditions and particularly conditions of martial law might tend to produce autocratic attitudes. However, in the observation of these groups of kindergarten children the democratic attitude for the most part seemed to predominate even in active war play. In the reports of teachers there was not a single instance of autocratic attitudes noted, and the few instances noted in the observation groups did not appear to be related to the war play but rather appeared to be personality manifestations of individual children. These children displayed the same autocratic attitudes in other play activities.

Although the war play frequently became markedly aggressive there was at no time any evidence of hostility noted in either observation group. In the questionnaire data teachers from only three schools reported seeing occasional instances of hostility; however, other teachers from these same schools claimed to see no evidence of hostility whatsoever. This apparent absence of attitudes of race prejudice, autocracy, and hostility points to the fact that even in war play the normal wholesome values of play seem to be retained. In fact, both the questionnaire and observational data gave some evidence of positive social values such as cooperativeness and humanitarianism coming out of war play. Time and time again throughout combat war play there were instances of children helping one another, seeing the situation as a whole, and adapting their individual play activities to the goal of the group. Humanitarian attitudes were brought out in dramatization of first aid and rescue work. In some instances these positive aspects of war play, although sometimes initiated by the teacher, were followed through with interest by the children and often recurred spontaneously.

In relation to emotional development it has been the contention of some that war play among children should be suppressed for the reason that it might lead to increased fears and general emotional instability. However, both the observational and questionnaire data revealed no single instance in which war play seemed to produce fear in children and in those few instances where emotional instability was observed this did not seem to be directly related to participation in war play. In fact, war play in many instances seemed to offer emotional release and to aid in overcoming fear. For example, one teacher reported that children who seemed to be afraid when they heard planes flying low overhead soon overcame this fear when they saw other children playing war games such as dropping bombs from planes.

In consideration of the relationship between participation in war play and personality factors several questions present themselves. Do only aggressive children take part in war play or do conditions of war also appear to influence the behavior of the passive or withdrawn child? From both the observational and questionnaire data it is apparent that the children who participate most frequently in war play are primarily the aggressive ones. However, it is noted that the passive child shows a definite interest and although he does not take part in active war play he does participate in the construction of war models and is frequently an observer of active war play. In addition, there is no evidence to believe that passive children participate any less frequently or aggressive children any more frequently in war play than they do in any other kind of cooperative group play. A second question concerning personality factors in relation to war play is, to what extent is leadership responsible for the development, direction, and general course of war play? All data revealed that the person who was the initiator of the war play was also often responsible for the organization and direction of the play, and was frequently a leader in any group play. In fact, this leadership was so apparent in the war play that in one instance a single boy was responsible for choosing the activity of block building and directing the building of three seaplanes by other children without placing a single block himself. He then directed the war play that followed but soon lost interest, left the group and went to the table to look at books. With this the war play broke up almost immediately and several children followed him to the book table. This boy, who was repeatedly the initiator and director of war play in this group, was also reported by his teacher to be a leader in his neighborhood group. A third question concerning personality factors in relation to war play is, do positive personality characteristics appear to be fostered by war play? All data from both the observational groups and reports of teachers on questionnaires point to a definite positive answer to this question. This does not mean that war play has any specific features which make it a particularly favorable learning situation but it does mean that war play probably offers as good an opportunity for the fostering of positive personality characteristics as is offered by any normal play situation. Both the teachers and the observers saw evidence that war play contributed to the development of an interest in perfection of construction, keenness in observation of detail, initiative, self-reliance, fair play or sportsmanship, cooperation, and general adaptability.

SUMMARY

From the data obtained in the investigation of war influences as evidenced in the play of kindergarten children in Honolulu the following summary is given:

1. Influences of war were evidenced extensively among kindergarten children and were not limited merely to making models of war in the creative activities but were also observed in active dramatic war play. War influences in the creative activities were represented primarily in the making of armaments, but there were also representations of symbols, defense measures, and the more positive phases of war. Although the war theme was prominent in these activities it was not an exclusive interest and there appeared to be joy in the activity for its own sake with a marked interest in detail and perfection. In other words, the normal values of the activity seemed to be retained.

War influences were most frequently observed in active dramatic play. The nature of this play was usually dramatization of the more aggressive phases of combat but there were also dramatizations of other aspects of war. In general the play lacked the continuity of the well organized project type of play and was characterized by a child-like transitory qualtiy. However, there was a definite carry-over from day to day and with careful teacher guidance the war play achieved some of the educational values of a directed project.

2. Instances of war play occurred daily and for the most part continued throughout the entire free activity period. The majority of boys participated in war play at some time, but some children, primarily girls and timid boys, were never seen to participate. This would tend to indicate that the war interest is manifested extensively in the play of a large proportion of kindergarten children but that it is not a primary interest of all children.

3. War interests were evidenced much more frequently among boys than girls in all activities. The boys' primary interest appeared to be in armaments and combat play, while the girls evidenced more interest in the less aggressive phases of war. While there appeared to be a definite relationship between sex and the manifestations of war interests no such relationship was apparent with regard to race or home background.

4. A parallel group of factors appeared to be responsible for the initiation and termination of active dramatic war play, namely: the completion and destruction of models in creative activities; the influence and distraction of outside stimuli; the aggressive direction and interference of a particular child; and the natural dramatic trend and climax of a normal play situation. The most common initiating factor appeared to be the completion of war models. Two additional terminating factors were the disapproval of the teacher and the absence of leadership.

The level of stimulation of active war play appeared to rise and fall in cycles. Factors which tended to increase the degree of stimulation were: long duration of play, excessive noise, over-realistic dramatization, the presence of over-aggressive or poorly adjusted children, frustration or teacher interference, fatigue, quarreling and destructiveness, aimless activity and general lack of supervision. Although the war play often became highly active, exciting, and hilarious, it seldom reached a harmful level of overstimulation.

5. There was no evidence that war play has an un-

desirable effect on social and emotional development. There was no instance where race prejudice, autocratic attitudes, or hostile feelings appeared to develop as a direct result of participation in war play, and there was some evidence of positive social values coming out of war play. Likewise, there was no indication that war play increased fear or emotional instability and in many instances it seemed to offer emotional release and aid in overcoming fear.

Some relationship was noted between participation in war play and personality factors. The aggressive personality type participated much more frequently in war play although the passive child was influenced to some extent by war stimuli. The quality of leadership also seemed to be an important factor in war play. There was evidence from all data that participation in war play as in any normal play contributes to the development of certain positive personality characteristics.

6. Hence war play which takes place among a large proportion of kindergarten children seems to be merely another normal manifestation of the effects of environmental stimuli. This play affords an opportunity for self-expression and the release of bodily tensions and at the same time appears to retain all the values of normal play. When supervised it seldom reaches a harmful level of over-stimulation, has no deleterious effects on social and emotional development, and even contributes to the development of some positive personality characteristics. Thus, we are led to the conclusion that there is no justifiable reason for suppressing war play. In fact, it would seem unwise and perhaps even dangerous to suppress war play since it has been shown that where war play is frustrated by teacher interference it tends to become over-stimulating and destructive. Among boys at least there is not only a definite need for expression of these war interests, but war play apparently offers a means of sublimating natural aggressive and sadistic impulses. It would therefore seem advisable for teachers to make use of what appears to be a normal play situation and attempt to guide war play in a direction which will foster positive educational values.

APPENDIX

QUESTIONNAIRE

We know children's play is affected by their surroundings. Therefore we are interested to know in what way the conditions of war are evidenced in children's play. On the basis of your observations in your group, will you please answer the following questions as accurately as possible.

1. Have you seen any war play in your group?

2. Describe in what way this has been evidenced, in:
   a. Painting or drawing:
   b. Clay work:
   c. Block building:
   d. Dramatic play:

3. Has this war play been limited merely to using models of war for creative endeavor, or have you seen groups engaged in actual dramatic war play?

4. Do you see evidences of war play daily, or just occasionally?

5. What proportion of the total playtime seems to be occupied in war play?

6. Does war play, or reference to war conditions, occur only during the free playtime, or do you also notice it during the rest of the school day?

7. Do all children at some time show evidence of war play, or have you noticed any children who never take part in war play?

8. What differences have you noticed in war play among boys and girls?
   a. In painting or drawing?
   b. In clay work?
   c. In block play?
   d. In active dramatic play?

9. Do you notice any difference in the extent to which different races take part in war play?

10. To what extent does the child's home background influence him in his war play?
    e.g. Does a child whose father is in the army or navy, or a defense worker appear to show more interest in war play than other children?

11. What seems to start active dramatic war play?

12. What seems to break up active dramatic war play?

13. Under what circumstances do you think that war play can become over-stimulating?

14. To what extent do children reveal certain social attitudes in war play?
    e.g. Race prejudice, social class distinction, democratic vs. autocratic attitude.

15. Is there any evidence of hostility, and is it directed toward certain individuals or groups of individuals?

16. Are there any instances where war play seems to produce fear in any children?

17. Do only aggressive children take part in war play or do conditions of war also appear to influence the behavior of the passive or withdrawn child?

18. Is the same person the initiator of the dramatic war play, as well as the leader in this play?

19. Is this same child usually a leader in any group play?

20. Is there any evidence of positive or constructive values in war play?

THE HURDLE JUMP AS A MEASURE OF THE MOTOR PROFICIENCY OF YOUNG CHILDREN[1]

DORIS M. HARTMAN

Introduction

The various studies of motor performance have given rise to two conflicting concepts concerning the motor sphere of activity, namely, 1) that there is a general motor ability, as contrasted to the concept, 2) that there are a number of specific motor abilities.

In view of the more recent studies which support the concept of specific motor abilities, the hurdle jump experiment by Cowan and Pratt (3) is of especial interest. The writers stated that "the form and height of a standard hurdle jump may be measured with sufficient exactitude to provide a quantitative test of gross motor coordination correlated closely with chronological age and applicable to children 3 to 12 years inclusive." (3, p. 121).

The present study was designed to determine the value of the hurdle jump as a measure of the motor proficiency of young children. Its objectives were:

(1) To determine the reliability of the hurdle jump.
(2) To discover the inter-relationship between hurdle jump achievement and the achievement on selected gross motor tests.

Selection of Tests

Each test used was selected on the basis of the following criteria: (a) it was considered to be a measure of gross motor coordination (as opposed to fine eye-hand coordinations) since the hurdle jump was of this type; (b) it could be scored linearly (as opposed to success or failure); (c) it had fairly high reliability. The study made by Jenkins (5) of children 5, 6, and 7 years, and that of Carpenter (2) with children of the primary grades, provided tests for approximately the ages considered in the present experiment. With the assistance of these studies the following tests were selected: (a) jump-and-reach, (b) standing broad jump, (c) baseball throw for distance, and (d) thirty-five yard dash.[2]

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[1] *This study, from the Iowa Child Welfare Research Station, was directed by Dr. Beth L. Wellman.*

Procedure

All tests were administered indoors with the exception of the thirty-five yard dash and the baseball throw for distance. It was necessary to give the latter test indoors in a large gymnasium for one group of children.

With the exception of the hurdle jump, three trials were given for each test and the mean derived from the three trials was taken as a single score to represent achievement on the tests. This procedure seemed justified on the basis of being more representative of the "real" ability than would any single one of the three trials.

The procedure for the hurdle jump followed closely that used in the Cowan and Pratt study (3). Starting from the lowest peg, each time the child was able to jump over the pole, it was moved up. No more trials were given when there were failures to clear the pole on two successive jumps. This procedure was followed in order that the results would be comparable to those of Cowan and Pratt (3).

The Subjects

The 56 subjects involved in the present experiment represented an age range of twenty-nine months. Between the ages of 49 and 78 months, 29 boys and 27 girls were tested. The children were drawn from the State University of Iowa Preschool group, the Junior Primary class of the University elementary school and from a parochial school.

Retest Reliability

The entire group of 56 children were retested on the battery of tests from one to fourteen days after the first tests were given. On the retest series the procedure was the same as in the first series, each child receiving three trials except on the hurdle jump. Table 1 indicates the test-retest correlations obtained. Tests having highest reliabilities were the hurdle jump and thirty-five yard dash, each having a reliability coefficient of .88. Cowan and Pratt (3) gave no reliability on the hurdle jump with which this coefficient may be compared. The reliability obtained on the dash is approximately the same as the retest reliability found by Carpenter for primary age children, but is considerably higher than that of Jenkins (5) who reported a reliability of .74 for children 5 to 7 years.

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[2] *In addition to these tests, items F, E and H of the Carpenter tests of motor educability were tried out, but were found to be too difficult for the children of this study.*

TABLE 1

RELIABILITY COEFFICIENTS FOR THE VARIOUS MOTOR TESTS BASED UPON RETESTS OF THE ENTIRE GROUP

Test	Reliability Coefficient
Hurdle Jump	.88 ± .02
Thirty-five Yard Dash	.88 ± .02
Baseball Throw	.83 ± .06
Standing Broad Jump	.86 ± .02
Jump-and-Reach	.63 ± .05

Reliabilities for the baseball throw and the standing broad jump are approximately the same as those found by other investigators (1) (5).

The jump-and-reach test yielded the lowest retest reliability coefficient. This may be partially explained through the differences between the heights of the stand-and-reach in the test and retest. In the performance on the jump-and-reach test, the child was first told to stand and reach. This height was subtracted from each of the three successive jump and reach trials which followed, to give the jump-and-reach score. In some cases it was noted that the child would jump and reach to the same height on test and retest but, due to the difference in height of the stand-and-reach on the different days, the jump-and-reach scores would differ. That the younger children had considerable difficulty in reaching at the same time they were performing the jump may also be an explanation for the lower reliability of the test. However, the reliability coefficient found in the present experiment is similar to that reported by Jenkins (5).

For the statistical computations to follow, first test scores were used.

Gesell Grading Method

Cowan and Pratt (3) studied the proficiency of the hurdle jump performance by a comparison of each child's achievement with that of his age group. The age divisions used by them for

4, 5, and 6 year old children are given below, with the number of children in each group tested in the present experiment.

Age in Years	Age in Months	Number of Children
4	48-59	15
5	60-71	27
6	72-83	14

The Gesell system of assigning letter grades to different levels of performance was used by Cowan and Pratt (3). According to this system, a grade of A+ is assigned if the child's performance falls within the top 19 per cent of his group, a grade of A if his performance falls within the top 20 to 49 per cent of his group, etc.

Per Cent	Letter Grade
1 - 19	A+
20 - 49	A
50 - 64	B+
65 - 84	B
85 - 100	C

Cowan and Pratt (3) reported the advancement in height of the peg jumped with increase of age. Using either the median jump or the Gesell "C", this development in the jumping achievement was shown. Table 2 gives the results of their study restricted to ages 4 through 6 years, which may be compared with Table 3 showing data from the present study. Both tables combine the sex groups. As the subjects of the present experiment do not exceed 78 months, the 6 year group includes children of

TABLE 2

GESELL "C" AND MEDIAN JUMP ACHIEVEMENT ON THE HURDLE JUMP FOR BOTH SEXES REPORTED BY COWAN AND PRATT

Number of Cases	Age	Number of Peg	
		Median Jump	Gesell "C"
37	4	5	2
40	5	8	5
27	6	9	6

only a 6 months age range, whereas the data in the 6 year group of Cowan and Pratt (3) included children from 72 to 83 months of age. Thus the lower median score obtained in Table 3 in this experiment may be expected. Other discrepancies may be partially explained on the smaller number of cases tested at each age level in the present study.

TABLE 3

GESELL "C" AND MEDIAN JUMP ACHIEVEMENT ON THE HURDLE JUMP FOR BOTH SEXES FOUND IN THE PRESENT STUDY

Number of Cases	Age	Number of Peg Median Jump	Gesell "C"
15	4	6	1
27	5	7	3
14	6	7.5	6

To study the relationship of the hurdle jump to the various motor scores, the Gesell grading system was used to convert achievement by age groups on each of the tests into letter grades. This procedure enabled inter-test comparisons of achievement for each child to be made. The small number of cases in each age group has resulted in percentages which can only be considered tentative.

The grade equivalents for the cumulative per cents on the jump-and-reach, the broad jump, the throw, and the dash tests were computed. After the letter grades had been assigned, each child's performance on the five tests was converted into letter grades. Only two cases were noted in which the same letter rating was consistently maintained on each of the five tests. Subject Number 1, who was a girl, and Number 35, a boy, each received a "C" rating on every test. Four children received identical ratings on four out of the five tests. There were four children who received among their scores an "A+" which was the highest achievement, and a "C", the lowest rating. Seventeen others received at least one "A" and one "C" showing there was much individual variability in performance on the different motor tests. These data bear out the findings in the literature concerning the irregularity in the individual motor profile.

Before the intercorrelations between the five motor tests could be computed, it was essential to discover if consistent sex differences in achievement existed. Should consistent sex differences be found, scores for the boys' and the girls' groups would need to be correlated separately. As other studies in the literature had reported the presence of sex differences at the upper pre-school levels (7) (8) but not at the lower levels on the same motor tests, it was necessary in the present study to divide the total group of 56 children into age groups.

The small numbers of children of each sex in the 4, 5, and 6 year groups used for the Gesell scoring were too limited to permit the accurate computation of sex differences. Therefore, the 56 children were divided into a younger group, 49 to 66 months, and an older group, 67 to 78 months of age.

TABLE 4

MEANS, STANDARD DEVIATIONS AND STANDARD ERRORS OF BOYS AND GIRLS BY AGE GROUPS ON EACH TEST

	49 to 66 months				67 to 78 months			
	Number	Mean	Standard Deviation	Standard Error of Mean	Number	Mean	Standard Deviation	Standard Error of Mean
Hurdle								
Boys	15	4.4	3.01	.81	14	8.0	2.20	.61
Girls	15	5.9	2.38	.64	12	5.5	3.10	.93
Dash								
Boys	15	10.8	1.66	.44	14	8.0	1.19	.33
Girls	15	9.7	1.28	.34	12	7.1	2.11	.64
Throw								
Boys	15	154.1	42.82	11.43	14	208.3	85.03	23.55
Girls	15	140.0	59.72	15.98	12	118.2	61.50	18.53
Broad Jump								
Boys	15	21.5	5.71	1.53	14	24.6	4.44	1.23
Girls	15	25.0	6.18	1.65	12	20.0	7.55	2.28
Reach								
Boys	15	2.1	1.24	.33	14	2.7	1.02	.28
Girls	15	2.4	1.61	.43	12	1.9	1.04	.31

Table 4 gives the means on each test, standard deviations, and standard errors of the mean of each sex for the younger and older groups. It should be noted that the scores for the dash are recorded in seconds, hence the numerically smaller mean is superior. A comparison of the means for the boys at the two age levels indicates that the younger group was excelled by the older group on every test in the battery. An inspection of the means for the two age groups of girls shows the superiority of the older on the dash, equality of the groups on the hurdle, and the superiority of the younger group on the baseball throw, the broad jump and the jump-and-reach. The group of girls 49 to 66 months excelled all other age and sex groups on the standing broad jump. The lowest performance on the jump-and-reach was made by the oldest group of girls. There appears to be some peculiarity in the sampling of girls.

The significance of the difference between the sex groups for the older and for the younger age groups was determined by the computation of *t* values.[3] For children 49 to 66 months, superiority of the girls was indicated on the jump-and-reach, broad jump, dash, and hurdle. The differences are not statistically significant at the 5 per cent level of confidence. The mean sex difference in ball throwing at this age was non-significant; however, the difference favored the boys' group.

Sex differences are more pronounced in the older group. At this age the boys' mean scores excelled those of the girls on every test, with the exception of the dash. Only on the baseball throw for distance, however, was the difference significant at the 1 per cent level of confidence. Sex differences at this age level on the hurdle jump yielded a *t* value of 2.34 which is significant at the 5 per cent level of confidence for 24 degrees of freedom.

Intercorrelations

As the object of the present study was to determine the value of the hurdle jump as a measure of motor proficiency, the computation of intercorrelations of the hurdle with the other tests was the next step in the analysis of the data.

It was found that the only sex difference at either age level which was significant at the 1 per cent level, in the motor abilities tested in the present study, appeared in the baseball throw for distance in the older age group. All other tests with the exception of the hurdle jump which was significant at the 5 per cent level in the older age group showed non-significant sex differences. Also the direction of the differences in the means for the sex groups at the two age levels was not consistent, that is, the girls were superior on four tests at the younger level, but superior on only one test at the older level, showing that

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[3] *All t values for this study were computed by the following formula, taken from Lindquist, E. F., A First Course in Statistics, p. 138.*

$$t = \frac{M_1 - M_2}{\sqrt{\left(\frac{N_1\sigma_1^2 + N_2\sigma_2^2}{N_1 + N_2 - 2}\right)\left(\frac{N_1 + N_2}{N_1 N_2}\right)}}$$

the differences in achievement could not be attributed to sex factors alone. Therefore, the sex groups were combined for inter-test correlations.

The Pearson product-moment method was used for the computation of the correlation coefficients. Table 5 shows the inter-test correlation coefficients when each test was correlated with every other test. The correlation of the hurdle jump with each of the other tests yielded coefficients ranging from .44 ± .07 to .53 ± .07. This indicated that knowledge of hurdle jump achievement would give a 10 to 15 per cent improvement in the prediction over a "best guess" of the probable success on the other tests.[4] As shown by the inter-test correlation, the hurdle jump appears to be of little value as a predictive measure of other motor abilities. Table 5 also shows the lowest correlations between any two tests to be that of the throw and dash which correlated .36 ± .08. The highest correlation was found between the dash and the jump-and-reach, .56 ± .06. In view of the high probable errors for the correlation coefficients, one test may have little value over another as a predictive measure.

TABLE 5

INTERCORRELATION AND MULTIPLE CORRELATION COEFFICIENTS BETWEEN THE VARIOUS TESTS

BOYS' AND GIRLS' ACHIEVEMENTS COMBINED

	Multiple Correlation	Intercorrelations			
		Dash	Throw	Broad Jump	Jump-and-Reach
Hurdle	.64	.53 ± .07	.44 ± .07	.47 ± .07	.52 ± .07
Dash	.66		.36 ± .08	.53 ± .06	.56 ± .06
Baseball Throw	.60			.41 ± .07	.54 ± .06
Broad Jump	.62				.53 ± .06
Jump-and-Reach	.71				

The relatively low inter-test correlation coefficients of the hurdle jump, as well as those of the other tests, seem to indicate that the five motor tests used in the present experiment are measuring different motor abilities.

Multiple Correlations

It was assumed that if the hurdle jump measured "general motor ability" of which the other tests measured but a part, the combined weight of the remainder of the tests could be expected to correlate more highly with the hurdle jump than each one had correlated individually with the hurdle jump.

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[4] *Lindquist, E. F., A First Course in Statistics, see graph p. 186.*

Griffin's (4) method of computing the multiple correlation coefficient was employed. Table 5 presents the multiple correlation coefficient of the hurdle jump with the remaining tests. It also shows the multiple correlation coefficients for each of the other motor tests when correlated with the others as a group. It will be noted that these multiple correlations are considerably higher than the single inter-test correlations. This finding confirms the assumption made in the previous paragraph.

When correlated with the four other tests, the hurdle jump had a multiple correlation coefficient of .64 which was similar to that of the other tests. Thus the hurdle jump does not appear to be a better index of the motor abilities tested in the present experiment than are certain other tests. No single test appears to be an adequate measure of the abilities included here.

SUMMARY AND CONCLUSIONS

The purpose of the present experiment was to determine the value of the hurdle jump as a measure of the motor proficiency of young children. An attempt was made to determine the reliability of the hurdle jump and to discover the interrelationship between hurdle jump achievement and the achievements on a group of gross motor tests.

In addition to the hurdle jump test as used by Cowan and Pratt (3), the gross motor tests used in the present experiment were selected on the basis of linearity of scoring, suitability to age, and reliability as shown by previous studies. The tests used were the jump-and-reach, the standing broad jump, the baseball throw for distance, and thirty-five yard dash.

The test and retest achievements of 56 children 49 to 78 months of age were recorded. The retest reliability coefficients of the various tests based upon the achievements of all 56 children showed the hurdle jump to be one of the most reliable measures. The hurdle jump and the thirty-five yard dash each yielded a correlation of .88. With the exception of the jump-and-reach which yielded a correlation of .63, all reliabilities were above .80.

The 56 children were divided into 4, 5, and 6 year old groups in order to make comparisons by the Gesell grading method used by Cowan and Pratt (3) and to make comparisons between achievements on each of the tests. A comparison of the various test achievements converted into Gesell letters showed much individual variability in performance from test to test on the motor skills tested.

The children were also studied in two age groups: the younger group ranged from 49 to 66 months, the older group from 67 to 78 months. There were no significant sex differences in motor achievements in the younger group although the girls were superior on all tests, with the exception of the ball throw. In the older group the sex difference in baseball throwing achievement was significant at the 1 per cent level of confidence, and in the hurdle jump achievement, the sex difference was significant at the 5 per cent level of confidence. On both of these tests, the boys excelled the girls. Since there were no consistent sex differences present at both the younger and the older age levels, the sex groups were combined for inter-test correlations.

The correlations of the hurdle jump with each of the other tests yielded coefficients ranging from .44± to .53 ±.07 showing that the hurdle jump, while positively related to them was of little value as a predictive measure of the other motor abilities tested. The low inter-correlations between the five motor tests (.36 + .08 to .56 ± .06) suggest that while the tests have something in common, different motor abilities have been sampled to a large degree.

Multiple correlation coefficients were computed for each test with the remaining tests in the battery. The multiple correlation coefficient of the hurdle jump was .64, in comparison with a range of from .60 to .71 on the other tests. Thus the other tests would appear to be as good single indicators of the motor abilities tested in the present experiment as the hurdle jump.

The primary objective of the present study was to determine the value of the hurdle jump as a measure of motor proficiency of the young child. As indicated by the two techniques used in the treatment of results, the motor achievement profile utilizing the Gesell letter grades and the single and multiple correlation, the hurdle jump as a single measure appears to be inadequate for estimating the motor proficiency of the kindergarten child, as determined by the tests used in the present study.

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THE EFFECTS OF EARLY INSTITUTIONAL CARE ON ADOLESCENT PERSONALITY (GRAPHIC RORSCHACH DATA)

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The Graphic Rorschach Examination is one of the recently developed projective techniques for the study of personality. The test manual includes specific directions for the administration and scoring of the test (7). These will consequently not be repeated here in detail. However, a brief description of the test may make more comprehensible the data which follow. The subject is required to draw what he sees in the Rorschach ink blots from the cards themselves. He is encouraged to alter the blot features in any way he desires, in order to give the best representation of what he sees. He is given colored crayons to use if he desires to use color in a representation of the percept.

It is apparent that the graphic product may adhere to the original attributes of the blot, to the attributes of the subject's concept of the thing perceived, or to a compromise between the blot and the subject's concept. Each drawing is rated separately on the following five scales:

Scale 1 - Role of relevant and irrelevant blot contours in the drawing of the thing perceived.
Scale 2 - Treatment of areas or natural divisions of the blot.
Scale 3 - Treatment of actual form of both contours and areas of the blot portion selected for response with reference to changes of form relevant to thing perceived.
Scale 4 - Use of the color of the blot.
Scale 5 - Ornamentation of the blot stimulus features by additions, and relevance of the additions to the percepts.

The rating on each scale represents the degree of compromise between blot and concept. The ratings range from 1 to 5 as follows:

1 - Extreme blot dominance
2 - Moderate blot dominance
3 - Balance between blot and concept
4 - Moderate concept dominance
5 - Extreme concept dominance

The test is a promising one as it is easily administered and the scales are well constructed and simply rated. Most important, the rated variables seem to have psychological significance and, even in our present state of understanding, apparently are of diagnostic and predictive value. The authors of the test have already found the test to differentiate normals, neurotics, schizophrenics, and patients with intra-cranial cerebral injuries (8, 10). The deviation patterns in the test have also been found of value in discriminating schizophrenic patients with good prognosis from those with bad prognosis (6).

Much of the value of the test is derived from the very clear manner in which it delineates the degree to which the subject's behavior is determined by the "concrete" or "abstract" attitude. Extensive attention has been given to this problem of concept formation. The most significant statement of the problem is probably that of Goldstein and his associates, however, for more than others, they stress the fact that the concrete and abstract attitudes are "capacity levels of the total personality." In the individual's performance in tests of concept formation, one observes the indissoluble relationship between personality traits and intellectual output.

The individual with the concrete attitude is deficient in regard to reasoning and conscious awareness of the implications of his behavior. In his behavior and intellectual existence, this type of person is unreflective and passive. He "surrenders" himself to the specific and immediate claims of his environment. On the other hand, the abstract attitude means that the individual is guided in his behavior by reflection, a conscious awareness of the implications of his behavior, an ability to transcend the very specific sensory impression and a desire to abstract the more general significance of the situation to which he is adjusting. Following Goldstein and Scherer's (5) analysis, the abstract attitude is "conscious" and "volitional".

The normal individual may favor either the concrete or abstract attitude, but his behavior ordinarily represents a compromise between both attitudes. However, marked defects in capacity for abstract performance occur among schizophrenics and patients with organic brain pathology. In tests of abstract performance, these individuals are characterized by deficient conceptualization and abnormal dependence on the immediate, concrete aspects of the problem situation.

Similar tendencies were found in the experiments with the Graphic Rorschach Examination. In his reproductions, the normal individual modifies the blot to fit his concept more accurately so that blot and concept features are both evident. A balance between blot and concept is most typical (score 3 on the scale) and there are more balanced responses than any other. Patients with organic pathology and schizophrenics show a large number of blot dominated responses, however. They tend to include features of a blot, irrelevant to the thing perceived, and again, the basic defect appears to be insufficient conceptualization.

Rochlin, Levine and Grassi (10) found that other clinical groups were not as readily isolated when they examined the drawings of individuals with such extreme concept dominance that the original blot could not be recognized. However, they have found extreme concept dominance in patients with convulsive disorders and no clinical evidence of focal organic pathology. The authors of the test do not analyze in detail the interpretive possibilities of extreme concept dominance. It should be pointed out that extreme concept dominance in a drawing, does not necessarily mean that the individual is characterized by the abstract attitude. Indeed, extreme disregard for blot features may be associated with an over-responsive reaction to the immediate demands of his thinking and feeling. Because of this and even though the behavior is unrelated to the world of reality, in this case the blots, the behavior and thinking may be described as "concrete" in approach. The individual may be unable to separate himself from the world of inner experience and to meet new situations reflectively. In addition, he may be unable to account for his behavior. Thus, the conscious and volitional aspects of the abstract attitude are lacking.

Previous studies have confirmed the general hypothesis that the child whose infant rearing was in an institution until approximately age 3, tends to demonstrate a conspicuously unique type of personality development even though his subsequent experience was with a family (1, 2, 3, 4). He is markedly differentiated from the child whose total experience has been with families, albeit foster families. Specifically, the institution child is socially less well adjusted, less secure, more likely to demonstrate problem behavior and more retarded in social maturity. He is more removed and isolated in his relationships with people, although there is an excessive craving for affection. Intellectually, he is more retarded than foster children with continuous foster home experience, and he is also inferior in relation to the normal population. His speech remains defective through adolescence. His school performance is consistently poor. The essential trends, however, are profoundly manifested in all aspects of personality, whether social, emotional or intellectual. These trends are:

1 - An exceedingly impoverished, meager, undifferentiated personality with related deficiency in inhibition and control, and
2 - Passivity or apathy of personality.

Both these tendencies are manifested in (1) personal trends such as restlessness, inability to concentrate, meagerness and apathy in personal relationships and emotional expression, and (2) intellectual trends such as low intellectual performance, inferior reasoning and abstraction, poor self-critical judgment, lack of ambition, absence of thoughtful, goal-directed behavior. The personal and intellectual trends are separated artificially for purposes of clarity and exposition. It is apparent that they are psychologically inseparable and - to relate our discussion to our previous one on the abstract, concrete attitudes - what we have been describing in the institution children is an unusual degree of "concretivity" which pervades all aspects of their behavior.

These conclusions have already been validated in some detail through a variety of experiments and observational procedures including among others tests of concept formation, a frustration experiment and a Rorschach examination (3, 4). The present report proposes to give additional experimental evidence based on data derived from the Graphic Rorschach Examination. If our hypotheses are correct, we should expect the institution children to demonstrate more extreme deviation from a normal balance between blot and concept, with deviation in the direction of concretivity.

The Experimental Groups

The experimental group consisted of 15 children, 8 boys and 7 girls, who ranged in age from 10 to 14 years (mean age 12 years and 2 months). They had entered the institution at a mean age of 4.5 months, and remained there for an average of 3 years and 3 months. At about 3 years and 7 months, they had been transferred to a foster home where they had been reared up to the time when they were studied. They had thus spent most of their years in foster homes, but the years of infancy were spent in an institution. These children will be called the institution group.

The control group consisted of 15 boys and girls equated with the institution group in terms of age and sex. They also ranged in age from 10 to 14 years (mean age 12 years and 3 months). They had entered their foster homes at a mean age of 14 months (range 1 to 23 months). Their total life experience, however, had been with families. These children will be called the foster home group. (See Tables 1 and 2.)

TABLE 1*

PRESENT AGE, AGE ON ADMISSION, TOTAL TIME UNDER CARE (MONTHS) OF INSTITUTION AND FOSTER HOME CHILDREN

	No.	*Present Age*			*Age on Admission*			Total Time Under Care		
		Mean	*Standard Dev.*	*Range*	*Mean*	*Standard Dev.*	*Range*	Mean	Standard Dev.	Range
Institution	15	146.19	13.99	127-160	4.46	2.13	1-9	141.72	14.06	119-166
Foster Home	15	147.39	14.11	126-169	14.12	7.74	1-23	133.93	13.36	113-153

* *In the tables that follow,* P *represents the per cent probability that a divergence as large or larger than the one found could have occurred by chance.* In the interpretation of results, a P less than 5 per cent was accepted to mean that the observed difference was a reliable one.

TABLE 2

DISTRIBUTION OF TIME UNDER CARE OF INSTITUTION CHILDREN (MONTHS)

	Mean	Standard Deviation	Range
Age at Admission to Institution	4.46	2.13	1-9
Age at Transfer to Foster Home	43.02	4.76	36-50
Time Spent in Institution	38.56	5.88	27-47
Time Spent in Foster Home	103.16	16.75	86-131
Total Time Under Care	141.72	14.06	119-166

Since little was known about the fathers, the two groups were compared only in regard to maternal background. The mothers in both groups do not differ in regard to national derivation and educational status. *However, the mothers of the* institution group are superior to those of the foster home group in regard to vocational status. The inference may be drawn that the mothers of the institution group are superior in intelligence to those of the foster home group. This difference is related to the intake process. The institution was more likely to be used as a resource by the competent parent who needed temporary help. Where the parents were incompetent and the need for long time care was obvious, foster homes were a more common resource. (See Tables 3, 4, and 5.)

TABLE 3

	Institution		Foster Home	
Birthplace of Mother	Number of Children	Per Cent	Number of Children	Per Cent
Russia, Poland, Austria	5	33	5	33
United States	10	67	10	67
TOTAL	15	100	15	100

TABLE 4

MATERNAL STATUS (MINNESOTA SCALES)

	Institution		Foster Home		Differences			
	Mean Score	Stand. Dev.	Mean Score	Stand. Dev.	Institution Higher	Foster Home	t*	p
Occupational Status	3.80	2.01	1.80	1.11	2.00		3.22	less than 1%
Educational Status	2.73	1.10	2.26	.71	.47		1.40	between 10 and 20%

* The 't' statistic is the ratio of the difference in means to the standard error of the difference in means, in which an improved estimate of the standard error of the difference for small groups is employed. See Lindquist (9).

TABLE 5

	Institution		Foster Home	
Reasons for Dependency	Number of Children	Per Cent	Number of Children	Per Cent
B.O.W.	11	73	5	33
Neglect			1	7
Death of Mother			2	13
Physical Illness of Mother	1	7	1	7
Mental Illness of Mother	1	7	3	20
Father Deserted	2	13	3	20
TOTAL	15	100	15	100

As is shown by Tables 6, 7, 8, 9, and 10, the two groups are also not discriminated in regard to number of replacements and length of last placement, and in regard to both subjective

TABLE 6

Number of Replacements	Institution Number of Children	Institution Per Cent	Foster Home Number of Children	Foster Home Per Cent
0, 1	8	53	7	47
2, 3	5	33	6	40
4 and over	2	13	2	13
TOTAL	15	99	15	100

Chi^2 = .16 P between 90 and 95%

TABLE 7

DURATION OF LAST PLACEMENT

	Institution Number of Children	Institution Per Cent	Foster Home Number of Children	Foster Home Per Cent
Below 5 years	2	13	2	13
Above 5 years	13	87	13	87
TOTAL	15	100	15	100

TABLE 8

FOSTER HOME STATUS (MINNESOTA SCALES)

	Institution		Foster Home		Differences		t	P
	Mean Score	Stand. Dev.	Mean Score	Stand. Dev.	Institution Higher	Foster Home Higher		
Children's Facilities	42.36	3.31	40.40	4.21	1.96		1.49	between 10 and 20%
Economic Status	52.75	4.36	49.02	14.24	3.73		.97	between 30 and 40%
Cultural Status	34.43	2.83	33.23	2.92	1.20		1.17	between 20 and 30%
Sociability Status	42.62	3.48	39.23	12.46	3.39		1.01	between 30 and 40%
Occupational Status	4.20	1.22	4.60	1.92		.40	.70	between 40 and 50%
Educational Status	2.46	.84	2.76	1.43		.30	.72	between 40 and 50%

TABLE 9

SATISFACTORINESS-UNSATISFACTORINESS OF FOSTER PARENT-CHILD RELATIONSHIP

	Institution Number of Children	Institution Per Cent	Foster Home Number of Children	Foster Home Per Cent
Very Satisfactory, Satisfactory	12	80	13	87
Neutral, Unsatisfactory, Outstandingly Unhappy	3	20	2	13

Chi^2 = .24 P between 50 and 70%

TABLE 10

DEGREE OF ASSIMILATION BY FOSTER HOME

	Institution		Foster Home	
	Number of Children	Per Cent	Number of Children	Per Cent
Complete or Partial Assimilation	14	93	15	100
Neutral or Unassimilated	1	7	0	0

Chi^2 = 1.00 P between 30 and 50%

and objective aspects of the foster home. The foster homes of both groups are equivalent in social, economic and cultural status. Similarly the two groups are equivalent in regard to satisfactoriness of foster parent-child relationship, and the degree of assimilation of the child by the foster family. A fuller statement on methods for evaluating foster home status is to be found in a previous report (4).

The sole difference between both groups, therefore, is the relatively superior economic competence of the mothers of the institution children. It is apparent that any evidence of personal and intellectual inferiority of the institution group, would sharply confirm the continuing and deleterious effect of the first 3 years in the institution.

The Graphic Rorschach Results

The foster home group shows a considerably higher per cent of balanced responses. (These are rated 3 on the Graphic Rorschach scale.) Fifty-one per cent of the foster home group's ratings are rated 3 as against only 25 per cent of the institution group's ratings. (t ratio 4.27, P less than 1 per cent.)

It is the impression of Grassi and Levine (7) that no normal has less than 40 per cent of 3 ratings in the Graphic Rorschach Examination. It is consequently of interest that more children in the institution group show less than 40 per cent of 3 ratings. Indeed, 13 of the 15 institution children as against only 3 of the 15 foster home children, show this degree of deviation from the normal balance between blot and concept.

Similar conclusions are apparent if we examine the individual scales. In comparing the two groups on these scales, we employ the suggestions of Dr. Kate Levine regarding blot-concept imbalance. In an unpublished study of normal adults, she had observed that among very few individuals did the percentage of ratings other than 3 exceed the following:

Scale I - 70 per cent
Scale II - 40 per cent
Scale III - 60 per cent
Scale IV - 60 per cent
Scale V - 80 per cent

The two groups were contrasted in regard to the number of children in each group who demonstrated a tendency to deviation from 3 that was greater than those listed above. It is evident that in Scales I, II, III, and V, the institution group shows a greater tendency to abnormal deviation from the normal balance trend.

TABLE II

	Institution		Foster Home			
Deviation from "3" rating	Number of Children	Per Cent	Number of Children	Per Cent	Chi^2	P
Scale I - Deviation 70% or more	14	93	4	27	13.84	less than 1%
Scale II - Deviation 40% or more	10	67	1	7	11.63	less than 1%
Scale III - Deviation 60% or more	14	93	9	60	4.66	between 2% and 5%
Scale IV - Deviation 60% or more	6	40	9	60	1.20	between 20% and 30%
Scale V - Deviation 80% or more	15	100	7	47	10.91	less than 1%
Total deviation - less than 40% of 3's	13	87	3	20	13.39	less than 1%
Use of color unrelated either to blot or to concept	12	80	0	0	16.25	less than 1%
Presence of at least one "1" rating	14	93	5	33	11.63	less than 1%

Scale IV warrants special attention. This scale measures the degree to which the subject adheres to the colors of the blot or substitutes the colors of the concept. It has apparently been the experience of the authors that among normals and even abnormals, the colors employed in the drawing are realistically related to either the blot or concept. We were consequently surprised to see an unusual tendency among the institution children to employ ornamental color unrelated either to blot or to concept. The child's explanation for this particular way of using color was usually "I like it". Scale IV made no provision for this type of color deviation. Such responses were consequently scored 3 when computing total tendency to deviation from 3. Since only the institution children used color in this manner, the quantitative difference in regard to total imbalance was actually minimized. It is obvious, however, that the institution children are markedly discriminated from the foster home group in their use of color. It is likely that we have evidence here of the greater trend among the institution children to irrational, primitive, completely ego determined response, in which conscious awareness of the implications of their behavior and active, reflective consideration of common social judgments are absent.

There are also more institution children whose drawings have received at least one rating of 1. The "1" rating refers to complete blot dominance to the point where the thing perceived is not recognizable. (It will be recalled that such ratings were most commonly found in the groups with cerebral pathology or schizophrenia.) The implication is that more institution children than foster home children show a trend to apathy, passive surrender to environmental stimulation and weak reorganization of their experience.

SUMMARY

In conclusion it may be said that the Graphic Rorschach Examination confirms previously developed hypotheses regarding the effects of early institutional rearing. Children whose major experiences had been with foster families and whose total experience has been with families (foster home group) were contrasted with a group of adolescents whose rearing in the first three years had been in an institution and whose subsequent experience was in foster homes (institution group). In the first place, the institution children show a greater trend to deviation from the normal pattern. In the second place this deviation is represented in an unusual adherence to the "concrete" attitude and conversely in inadequate conceptualization. Lastly, this "concretivity" is specifically represented in such qualities as apathy in relation to environment and behavior that is unaccountable and without conscious purpose.

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